WESTERN GAS

13257

OCT – 6 1934

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REYNOLDS Gas Regulators are proved products. They have 40 and more years of successful operation in a field that is outstanding for its rigid requirements. And as the Gas Industry has progressed to meet modern demands, Reynolds has paced the field in the development of Gas Control Equipment that will give satisfactory control limits, capacity range and economic operation over a long period of time.

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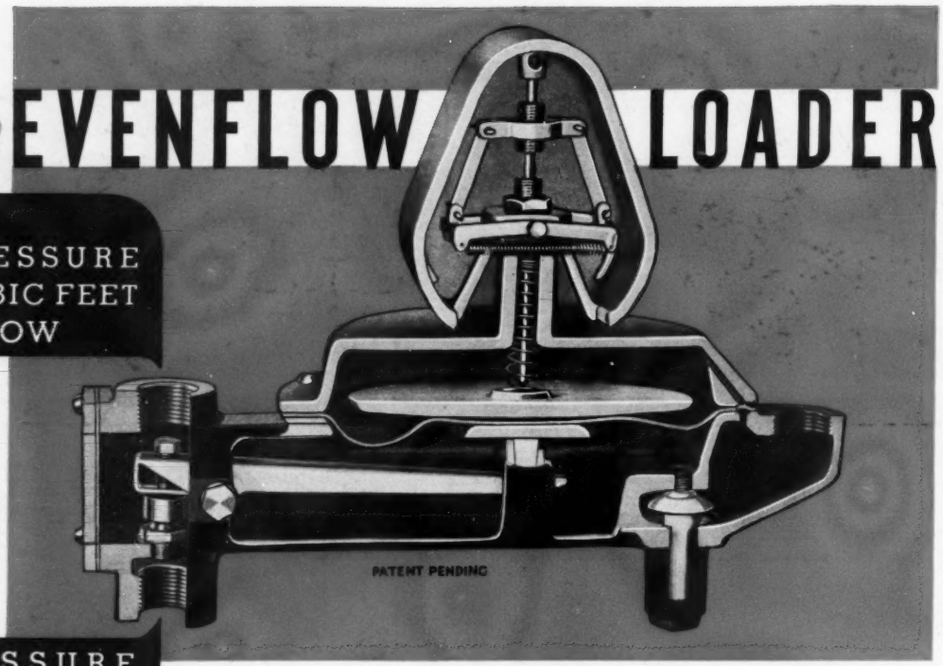
ANDERSON, INDIANA, U. S. A.

October 1934 ♦ ♦ 25 Cents

Only the New EVENFLOW LOADER

NO DROP IN OUTLET PRESSURE WITH 1100 CUBIC FEET PER HOUR FLOW



The Mueller Evenflow Loader is adaptable to a number of makes of Service Regulators. Tell us what make and type you are using, and we will send complete facts regarding the adaptability of the Evenflow attachment.

INLET PRESSURE AS LOW AS ONE-HALF POUND

. . . can give this new degree of accuracy in pressure regulation

When we say the Mueller-Groble Regulator with Evenflow Loader will give gas pressure regulation that cannot even be approached by other methods, we are simply citing records that have been repeatedly confirmed by field tests!

While this ability to maintain its set outlet pressure under heavy or erratic loads is partly due to the excellent design of the regulator itself, it is chiefly a result of the Mueller Evenflow Loader —an attachment that marks the greatest stride of recent years in pressure regulation.

This attachment is illustrated above. It is a simple and therefore trouble-free arrangement of springs and levers which compensates for the varying pressure of the regulator spring, making the regulator more responsive to pressure changes and able to maintain the set outlet pressure over an extremely wide range of volume flow.

Do not confuse the Mueller Evenflow attachment with devices which attempt to correct uneven pressures at the valve. Unlike such devices, the Evenflow Loader corrects the *source* of pressure variation and is therefore effective even when there is an abnormal amount of tar or other substance in the gas. Also it is effective at far lower inlet pressures than is possible with any other method of regulation.

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Let it prove its case in your service

So outstanding is the performance of the Mueller-Groble Regulator with the Evenflow Loader that we will gladly furnish a Regulator *without charge* to any gas company desiring to make tests. Try one on your toughest job—the pressure regulation job where other types have proved ineffective. The result of your tests will be your final reason for standardizing on the Mueller-Groble Regulator with Evenflow Loader.

MUELLER CO., Decatur, Illinois

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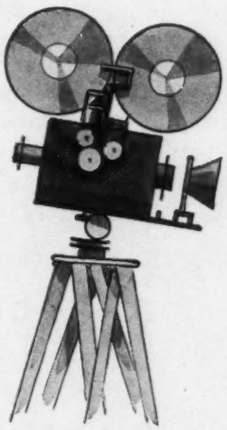
GAS REGULATORS and GOVERNORS

NATURE CRUELLY TESTS DRESSER *Flexibility!*



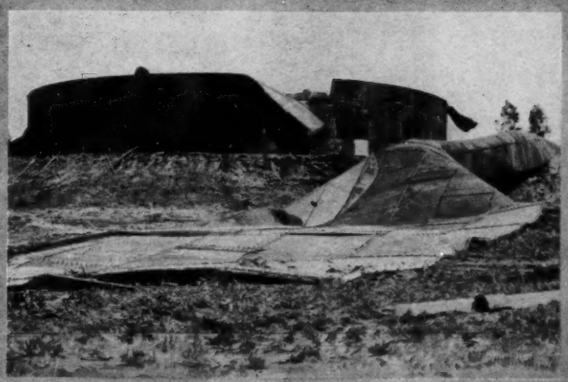
The following is quoted from an engineering report on the effects of the earthquake on pipe lines: *"Much of the trouble could be avoided by providing a reasonable degree of flexibility in piping connections."* The lessons learned from past disturbances clearly indicate the superiority of Dresser flexibility in meeting such shocks. Elsewhere, too, the same flexibility is preventing leakage and avoiding maintenance in the less spectacular but equally efficient service rendered by millions of Dresser Couplings.

★

The Board of Fire Underwriters of the Pacific have ruled as follows in regard to new equipment: "Flexible couplings ('Dresser' Flexible Lock Coupling, Style 67, or equivalent coupling designed for use in earthquake localities) are to be provided at top and bottom of all sprinkler system main risers, and also tank risers which pass through a building. Flexible couplings may also be required at each floor level in multi-story frame buildings and where floors are over 18 feet in height in fire resistive buildings."

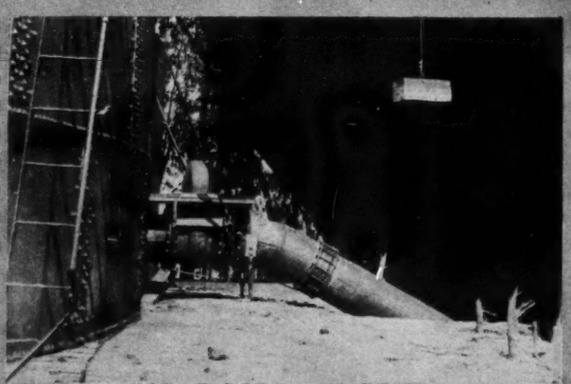
S. R. Dresser Mfg. Company
BRADFORD, PA.

In Canada: Dresser Mfg. Company, Ltd., 32 Front Street W. Toronto, Ontario.



RIVETED TANK WRECKED BY EARTHQUAKE — Rivet heads were sheared from the sides of this water tank, and some of the plates were blown 200 feet from their original position.

★



FLEXIBLE JOINT "CAME SMILING THROUGH"—This 24-inch Dresser Coupled outlet pipe from above tank was miraculously spared from damage, furnishing dramatic and conclusive proof of Dresser flexibility.

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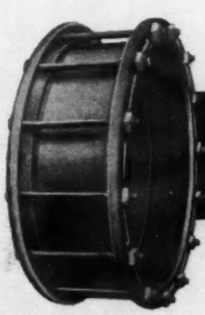
RIGID JOINT FAILED TO HOLD PIPE—typical failure of riser connection in a sprinkler system. In other cases threads were stripped, flanges were cracked or the pipe was broken. Failures in sprinkler systems are now prevented by special Dresser Couplings for joining risers flexibly.

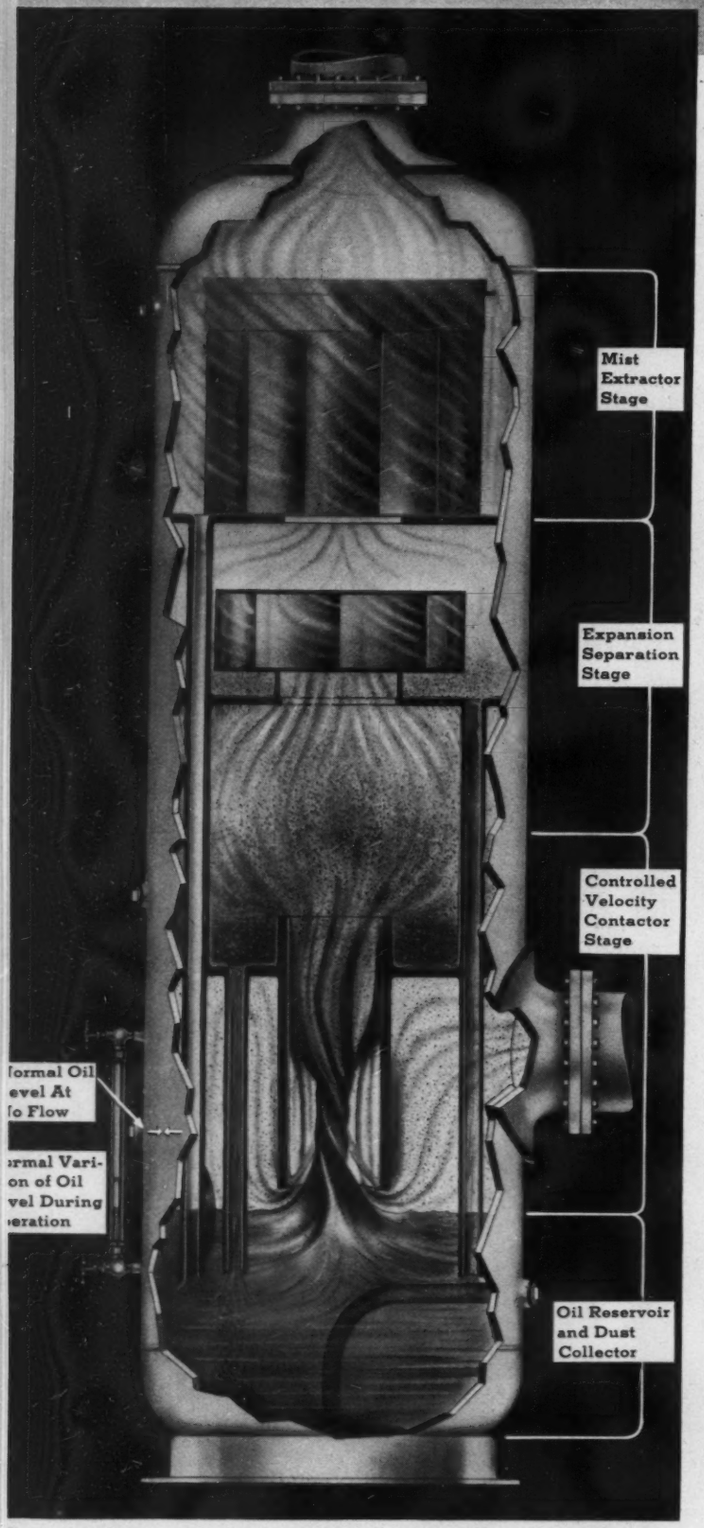


DRESSER *Couplings*

THE JOINT WITH FLOATING GRIP

October, 1934. Volume X, Number 10. Western Gas is published by Western Business Papers, Inc., at 810 South Spring Street, Los Angeles, California. Subscription price (in advance) 25 cents the copy; $2.00 per year; 2 years $3.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

BLAW-KNOX GAS CLEANERS


Mist Extractor Stage
Expansion Separation Stage
Controlled Velocity Contactor Stage
Oil Reservoir and Dust Collector
ormal Oil evel At o Flow
rmal Vari- on of Oil vel During eration

Cut away drawing showing operation of Blaw-Knox Gas Cleaner.

Deliver clean gas.

Remove all dust and liquid entrainment.

Operate without attention or shutdowns over long periods. Are capable of continuous operation.

Offer negligible resistance to gas flow.

Collected material is taken from path of gas flow and is quickly removable without shutting off gas flow.

Liquid contactor type.

Clean gas reduces maintenance costs, service calls and insures better public relations. Let us tell you about the experience of others using Blaw-Knox Gas Cleaners. We will be glad to demonstrate how this equipment can be adapted to the working conditions of any company.

BLAW-KNOX COMPANY
2033 Farmers Bank Building
Pittsburgh, Pa.

BLAW-KNOX GAS CLEANERS

"The pipe is wonderful and we won't use anything else"*

The maker affirms. The user confirms. When we announced in February that Super-de Lavaud Pipe had more than *doubled impact-strength* with greater ductility and toughness, we based our statements on hundreds of tests and a year's production. Now, in October, we have a file of evidence from all parts of the country confirming those statements. *In 20 months we have made and sold over seven million feet* of Super-de Lavaud Pipe. Its outstanding feature is extraordinary resistance to damage from shocks in transportation, handling and laying. With reasonable care breakage is practically unknown. Super-de Lavaud is tougher, stronger and more ductile pipe because it is *cast without chill in a metal mold* by a patented process of centrifugal casting. Send for booklet.

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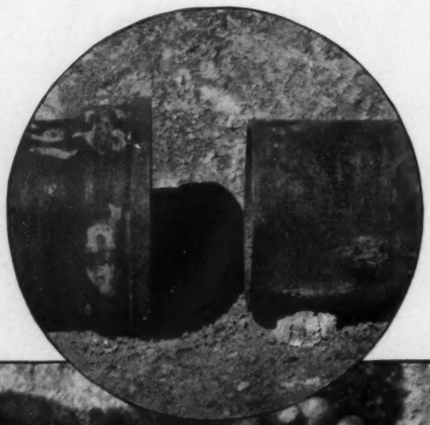
Foundries and Sales Offices throughout the United States

*From statement of user in our files.

U.S. SUPER-DE LAVAUD PIPE

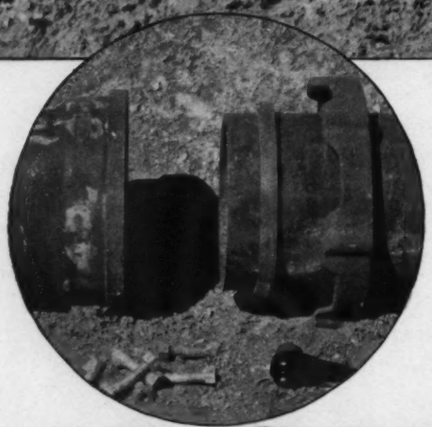
IMPACT RESISTANCE INCREASED MORE THAN 100%

Cast iron pipe with gas-tight mechanical joints meets reemployment conditions perfectly, requiring no skilled labor and no tool except a ratchet wrench.



Note the ease and simplicity of installation. Adjust follower-ring and gasket, tighten a few bolts and the job is done.

Several mechanical joints are made by C.I.P.R.A. members. They differ in design but derive from the same basic principle. All are gas-tight in service.



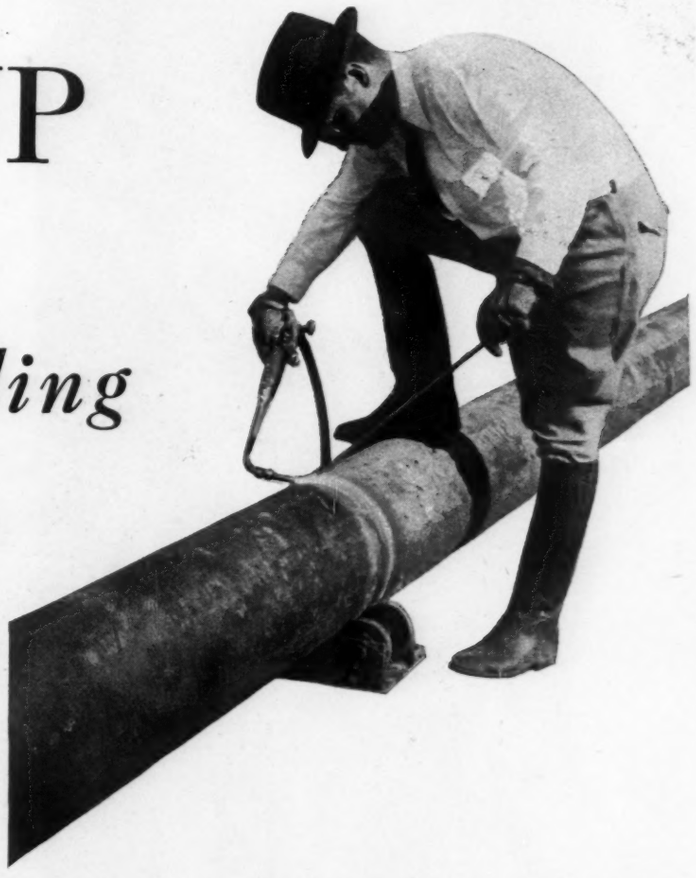
For further data, write to The Cast Iron Pipe Research Association, Thos. F. Wolfe, Research Engineer, 309 Peoples Gas Building, Chicago, Illinois.

CAST IRON PIPE

with gas-tight mechanical joints

"WE ORDER EVERYTHING FOR PIPE LINE WELDING FROM LINDE"

UP and UP go *Lindewelding Savings*



LINDEWELDING ten miles of 10-in. pipe was a small job for this company, which employs some of the best Lindewelders in the country. But Linde Process Service could *still* be of help.

Linde Service men showed them the latest Lindewelding technique. Where it formerly required 13 minutes per weld, it now takes less than ten. Similar savings were made in material costs. This additional efficiency was not gained through improvement in manual skill—but through use of the latest developments in Lindewelding.

Linde Process Service was able to boost the construction profit on this already well-organized pipe line. Progressive "pipe-liners" who, like this company, buy *everything for pipe line welding from Linde*, can depend on Linde Process Service to bring them the latest and best pipe-line welding methods, and to help organize welding operations for the greatest speed, soundness and profit.

With developments taking place from day to day, you may be losing money by not taking advantage of Linde Process Service. The nearest Linde Sales Office has the latest information on Lindewelding practices and will gladly show how you can profit by it.

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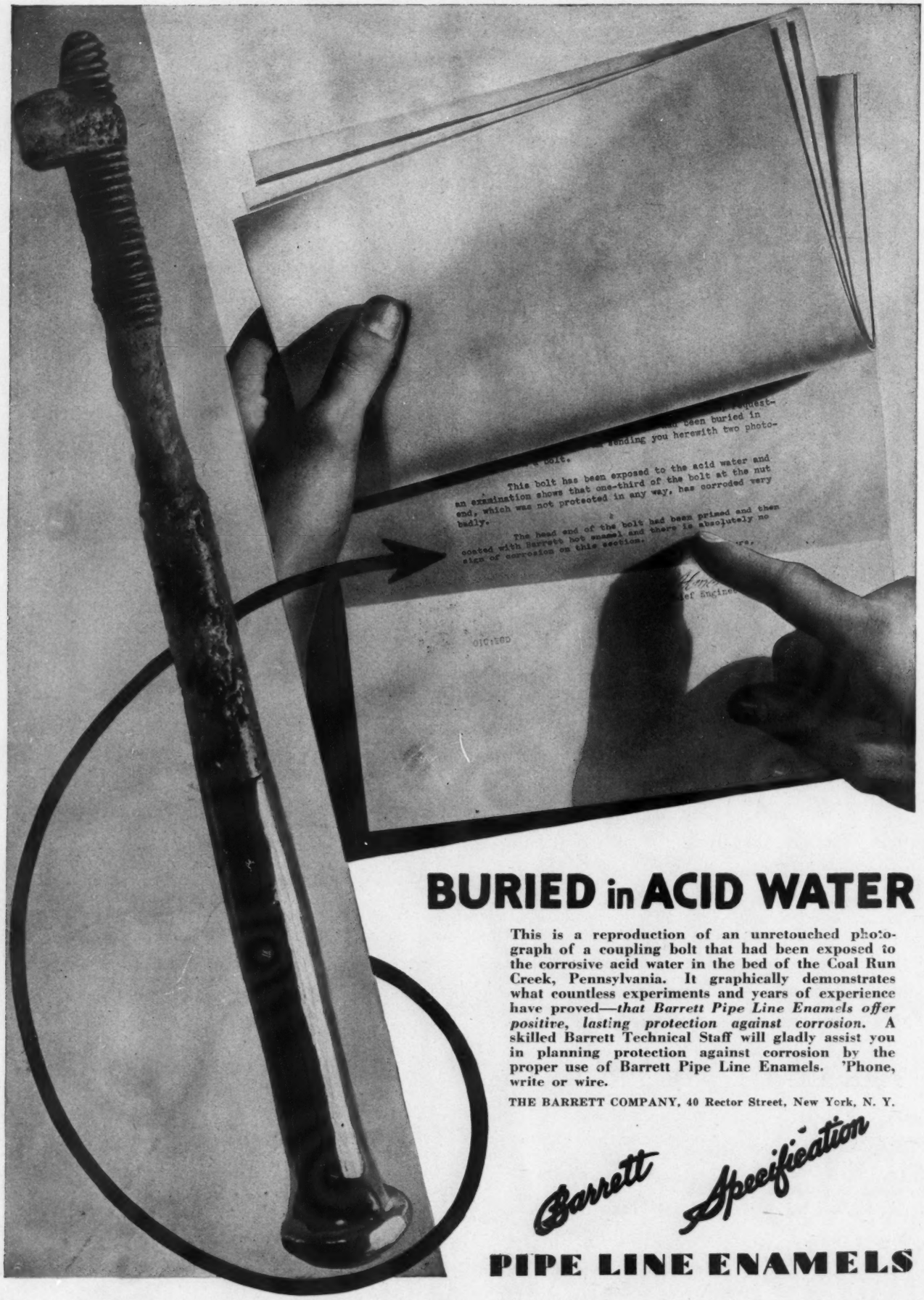
been buried in
sending you herewith two photo-
This bolt has been exposed to the acid water and
an examination shows that one-third of the bolt at the nut
end, which was not protected in any way, has corroded very
badly.
The head end of the bolt had been primed and then
coated with Barrett hot enamel and there is absolutely no
sign of corrosion on this section.

BURIED in ACID WATER

This is a reproduction of an unretouched photograph of a coupling bolt that had been exposed to the corrosive acid water in the bed of the Coal Run Creek, Pennsylvania. It graphically demonstrates what countless experiments and years of experience have proved—*that Barrett Pipe Line Enamels offer positive, lasting protection against corrosion.* A skilled Barrett Technical Staff will gladly assist you in planning protection against corrosion by the proper use of Barrett Pipe Line Enamels. 'Phone, write or wire.

THE BARRETT COMPANY, 40 Rector Street, New York, N. Y.

Barrett Specification

PIPE LINE ENAMELS

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WESTERN GAS

"Reg. U. S. Pat. Off."

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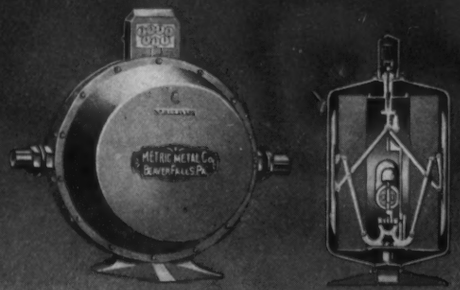
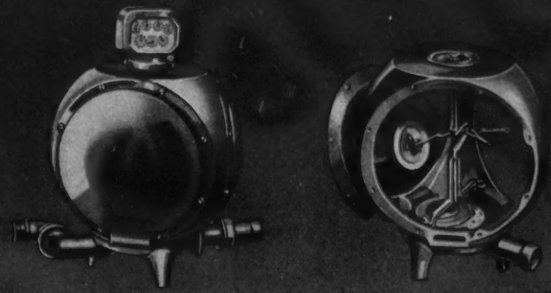
JAY JENKINS, Publisher, GEORGE H. FINLEY, Editor, CRAIG ESPY, Mid-Western Manager
OFFICIAL PUBLICATION, Pacific Coast Gas Association; Southern California Meter Association

• from the first meter made for natural gas to the most modern instruments of today



1888



1892

1909

1888—1892—1909—1915 are mileposts in the development of the natural gas industry. . . . Mileposts in scientific progress, as well as in efficient measurement which helped to build an economically healthy industry.

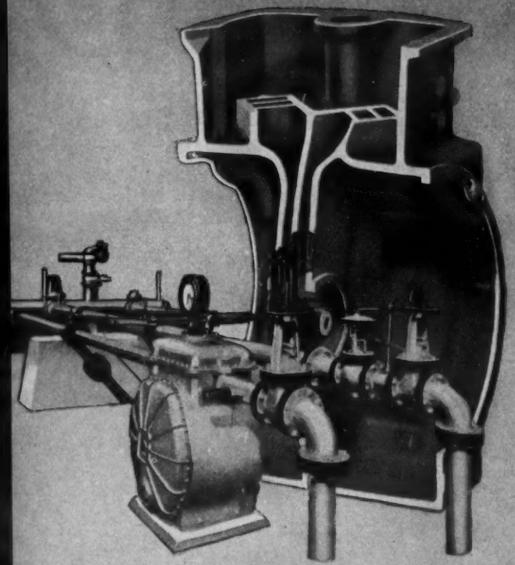
• 1888 . . . In 1888 the first natural gas meter was made by Metric Metal Company at Beaver Falls, Pennsylvania. It was the original Type C meter, and was made of cast iron and brass to withstand a pressure of 30 pounds per square inch. It had two gas compartments—the space within the outer case and that within the diaphragm. The valve action was actuated by the expansion of the diaphragm.

• 1892 . . . The Tobey meter—an important advance in accurate measurement under varying pressures of the day—was introduced by Metric in 1892.

In a cast iron body this meter used three diaphragms. The smaller sizes used rotary valves; larger models utilized oscillating or wing type valves. The valves operated on a three-port valve seat. Adjustment was accomplished by changing gear wheels in the back of the index.

• 1909 . . . Increased efficiency of appliances, and greater value of the fuel, at this time required a meter to operate at full capacity at much lower loss of pressure or differential. Metric had anticipated this, and in 1909 introduced the Ironcase A meter, forerunner of the present Ironcase B.

• 1915 . . . marks the establishment of the modern standard of gas measurement by both displacement and orifice.



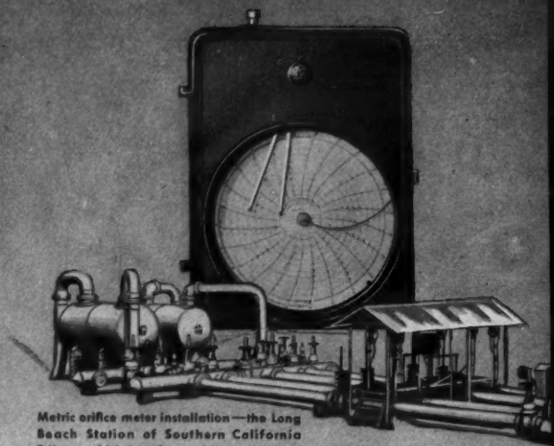
The Ironcase B meter in a modern hookup with a Metric orifice meter. A Metric differential valve provides automatic changeover from one instrument to the other, making possible a capacity range of 2,000 to 100,000 cubic feet per hour.

The Metric Ironcase B meter provides the highest degree of accuracy yet attained commercially. Internal leakages are eliminated. Important as this is where internal leaks might cause failure to register on pilot lights and refrigerators, it is still more important on higher pressures.

Its one-piece construction (see cutaway view at the left) abolishes machined joints and gaskets between case, table and channels. They are cast as one unit. Larger sizes feature Alemite lubrication of bearings and other improvements.

In 1915 Metric was first to apply orifice measurement to natural gas, providing in the field of pipe line measurement a degree of accuracy exemplified by a recent installation which is measuring Chicago's natural gas between two stations at the rate of 50 to 150 million cubic feet per day WITH AN AVERAGE DIFFERENCE BETWEEN THE TWO STATIONS OF LESS THAN .01 OF 1 PER CENT!

The full line of Metric instruments—including the Base Volume and Pressure Indexes for direct high pressure displacement meter readings—were exhibited at the Diamond Jubilee Exposition.



Metric orifice meter installation—the Long Beach Station of Southern California Edison, which has the world's greatest installed capacity for measuring natural gas.

METRIC METAL WORKS *ERIE, PENNSYLVANIA*

AMERICAN METER COMPANY

INCORPORATED

ESTABLISHED 1836

AMERICAN · D. McDONALD · METRIC · MARYLAND · PACIFIC · TUFTS · WESTCOTT · GRIFFIN · H & Mcl · RELIANCE

October, 1934

WESTERN GAS

"Reg.U. S. Pat. Off."

Vol. X, No. 10

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

British Cooking Tests Prove Gas Superior *to* Electricity

AMERICAN readers will welcome the summary presented in these pages, covering an English study of domestic cooking results secured in comparative tests by gas and electricity. The tests were comprehensive and every precaution was taken to make results truly comparable as between the two fuels. They were made by the staff of the Good Housekeeping Institute, London, in 1933, under the direction of Mrs. D. D. Cottington Taylor of the Gas Light & Coke Co., London.

It will be noted from the following summary that gas appeared to decided advantage in respect to cost, cooking speed, convenience of equipment manipulation, and securing of good results by inexperienced operators.

Western Gas acknowledges with appreciation the courtesy of Mrs. Taylor in making available the full text of this important study, which is summarized below.

Scope of Tests

Three pairs of gas and electric cookers were examined, which were considered suitable for families of three, five and seven persons. Each cooker was tested on a seven-day week menu, these menus intended to represent meals prepared by a middle class housewife.

In addition, the following tests were carried out: Christmas dinner for large number of persons; five-course dinner for 10 persons; water heating tests for appropriate quantities of water for domestic purposes; one day's jam making; ham boiling.

No special instructions were given, other than those supplied with the cookers, except that the vegetables were cooked in the minimum of water such as is favored by electrical demonstrators. The same recipes and weights of ingredients were used for both electric and gas cookers but the operators were allowed to manipulate the cookers at their own discretion as long as they kept to the printed instructions of the manufacturers. At the end of a complete week the operators changed over so that both used each cooker.

The cookers chosen were those recommended and sold or hired by electric or gas undertakings for the number of persons required, and were as far as possible representative of those found in the London area. Utensils were normal good quality aluminum ware except in cases where special vessels were supplied with the cookers. Water boiling tests were carried out using a gas kettle and an electric kettle, and with special and normal kettles on the gas and electric hot plates.

Convenience

The tests demonstrated that with an electric oven the heat is not immediately available owing to heating up of the elements and storing up some energy in the mass of the elements. If this energy is to be used the current must be switched off before the end of the cooking process and this requires a certain amount of judgment. Electric cooking thus requires more systematic operation for ideal results. Use of residual heat is sometimes claimed as an advantage of electricity, it not being realized that it has had to be stored during the heating process.

The skilled operators conducting the London tests found 7 per cent advantage in favor of gas in the amount of operation of taps or switches required. It was brought out that the three position electric switch does not give as flexible adjustment as the gas tap, and that simmering is more difficult on an electric cooker. (Operation by the average housewife would make the advantage of gas equipment of even more importance, as regards operation of taps or switches).

Time

On the week's cooking, gas was 8 per cent quicker on the average, most of

More Appliances Eligible For Federal Housing Loans

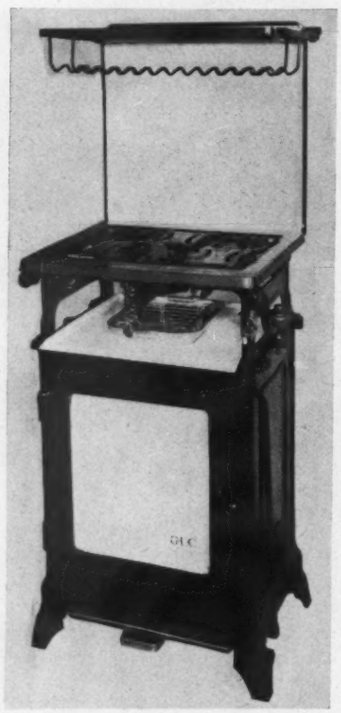
ANY gas-fired appliance connected with gas piping is eligible for financing under insured building improvement loans, by September ruling of the Federal Housing Administration. Under this modification stoves, water heaters, refrigerators, etc., may qualify, the only items excluded being portable appliances connected with flexible tubing.

Importance of the Federal Housing Administration program to gas new business departments was noted in the last issue of *Western Gas,* when it appeared that financing would only extend to "built-in" appliances.

TABLE NO. 1

Test No.	Oven	% Loss in Wt.	% Loss excluding fat	% gravy
1.	Gas	21.5	16.5	2.4
	Electric	21.0	15.0	2.5
2.	Gas	24.5	17.5	0.7
	Electric	21.0	16.0	2.6
3.	Gas	24.5	19.0	1.7
	Electric	24.0	13.0	3.0

the saving in time being on the meals required quickly, such as breakfast, which was 30 per cent faster by gas (except in one comparison where the most efficient electric and the least efficient gas cookers were used, in which instance gas was only 8 per cent faster). A little extra quickness with electric cookers would have been obtained had current not been turned off until the end of the operation, but this would have resulted in increased cost.



A gas range used in the British cooking tests.

On water-boiling tests the time required with electricity was always greater than with gas, the excess varying from 11 per cent to 200 per cent, and averaging 63 per cent.

Cooking Quality

The quality of cooking was shown to be practically identical. An advantage often claimed for electric oven cooking is that the shrinkage of meat is very much smaller than with gas cooking. This alleged saving on shrinkage is frequently converted to a money basis in electric promotional efforts, in this manner: Knowing the initial cost of the meat per pound, the alleged saving is offset against the cost of current. Quite apart from the point as to whether or not there is smaller shrinkage, shrinkage is mainly due to loss of water and the nutritive value of the joint of meat would be little changed. Losses that occur during cooking of meat depend partly on loss of water by evaporation and partly on production of fat and gravy. A number of factors affect this loss. One is composition of the meat, fat losing more than lean. Completeness of cooking is an important factor. Underdone meat may give half the total cooking loss obtained with well cooked meat, this being dependent on temperature at which the meat is cooked, and not on whether the tin holding the meat is open or closed. It seems evident that the fuel used to obtain a cooking temperature has no influence on the loss of weight by shrinkage.

One of the electric ranges.

The test comparisons of shrinkage in gas and electric ovens, obtaining as nearly as possible the same condition of cooked joint, are given in Table No. 1.

From these results it will be seen that there was slightly smaller loss in these tests with the electric cookers.* It is, however, of interest to note that the amount of gravy is greater with the electric cooked joints.

Cost

The comparison of costs with the two media was expressed in these tests by giving the price per unit (kilowatt hour) at which the cost of electricity would equal that of gas at 8.6 pennies per therm. (Expressed in American money, at the rate of 2 cents per penny, this would be equivalent to 86 cents per thousand cubic feet of 500 B.t.u. per cubic foot gas.) With the original combinations of cookers and utensils this equivalent price, averaged over the whole week, was 1.08, 0.82 and 1.00 cents per kilowatt hour for the three-, five-, and seven-person weekly menus respectively. From these data, and those supplied by the water-boiling tests, figures have been deduced for various combinations of cookers and kettles. The equivalent kilowatt hour price is in all cases less than 1 cent, and averages 0.84 cents for all cases taken.

Other equivalent prices were:

Kind of Cooking	Equivalent price of electricity in cents per kw. hr.
Xmas dinner—3 persons	0.84
Xmas dinner—10 persons	0.78
Xmas dinner—12 persons	0.82
Special dinner—10 persons	0.86
Jam making	1.08
Ham boiling	0.74

Results secured in the English tests reported above bear out American experience, and it is evident that the competitive position of gas is even stronger in many American areas where natural gas is available.

*Investigators appreciate that a slight variation may be expected in test results on meat shrinkage, due to such factors as varying fat and water content, meat texture, age and feeding of animal, etc. A variation is even encountered in corresponding joints from the same animal. This can very well shift the advantage between fuels used, with respect to this shrinkage test. Results recently brought to our attention, obtained on the Pacific Coast, gave the advantage to gas cookery as regards shrinkage.—*Editor.*

Gas kettle used in comparative water boiling tests.

Service Connections to Cast Iron Pipe

By HENRY S. HARRIS

Assistant Engineer
*Los Angeles Gas and Electric Corporation**

IT HAS not been the purpose in this report to discuss the merits, or demerits of cast iron pipe except wherein those qualifications might affect the installation of a service fitting. No doubt, the reason why cast iron pipe has not been used to a greater degree is because of the service connections, and this is particularly true on the Pacific Coast where high pressure gas prevails.. We shall see that the modern high strength cast iron pipe is apparently quite satisfactory for the brazing on of service connections, at least in the smaller sizes.

Henry S. Harris

We must not overlook, however, that mechanical joint cast iron pipe may be laid without the use of welding carts and tar kettles; in fact only a rachet, or spanner wrench is necessary, and thus the desirability for a *mechanically* jointed service connection is important, particularly in territories where welded steel pipe is not used. This report will offer a few novel methods of mechanically connecting the service piping to the cast iron pipe.

This committee made shop tests on more than 75 brazed service connections installed under varying conditions, and more than 75 pieces of 4-, 6- and 8-inch cast iron pipe were destroyed to determine impact tests, breaking loads and other observations.

Preliminary Investigation

A majority of the cast iron pipe used for gas distribution systems in the United States is low pressure, and for the most part threaded connections are used. Where high pressure is encountered some sort of clamp with corporation cock is usually employed. In the majority of cases swing joints, or rubber gasket couplings are used to remove the purported strain from the cast iron line.

Regarding the use of a threaded service connection, an investigation of cast iron pipe breaks in one company's system showed during one year about 60 breaks, nearly all occurring in 4-inch cast iron pipe right at the service connection, and most of these being 1¼-inch connections. It was the conclusion from this investigation that too large a tap in the main would weaken it to a point where there was danger of breakage from an external load, but that there would be little, or no breakage, if the service connection were 1 inch in size.

Where the high strength cast iron pipe is used in the lighter weights (thinner walls), because of the few threads obtained in tapping the side wall of the cast iron pipe there looms even a greater possibility of thread leakage than on the old cast iron pipe.

The Los Angeles Gas and Electric Corp. has been bronze-welding large service connections to old sand cast pipe with varied success for some time, and has bronze-welded connections to nearly 10,000 feet of the modern cast iron pipe without a known leak, or break. In every case to date, though, it was considered advisable to expose the cast iron pipe to an expansion joint before welding. In the future this company does not intend to make this additional excavation unless the procedure gives an abnormal amount of breakage.

From one-year burial tests, using copper-iron combinations in highly corrosive soils, it is concluded that the amount of bronze necessary to make a service connection will not induce corrosion.

A four-year inspection and investigation by the U. S. Bureau of Standards has shown the same results.

Physical Tests

Our first tests were to run beam tests on 6-inch cast iron pipe with and without service connections. For these tests Mono-Cast, DeLavaud, Super-DeLavaud, and Pacific States cast iron pipes were used, and from a preliminary study of the test results it seemed that the Mono-Cast was somewhat affected by the brazing. From previous text this result did not seem consistent. Further study showed that the Mono-Cast pipe being used was of a lesser wall thickness than any of the other pipe and that there could be little doubt but that the Mono-Cast

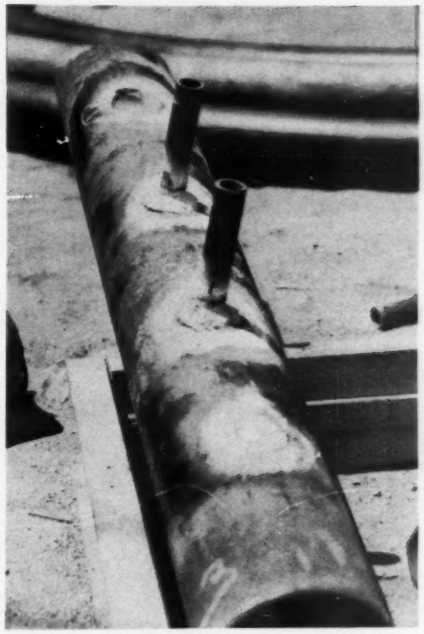


FIG. 1.

FIG. 2.

FIG. 1 AND FIG. 2 SHOW RESULTS OF IMPACT TESTS

* Excerpts from a report of the Pacific Coast Gas Association sub-committee on Service Connections to Cast Iron Pipe, Henry S. Harris, chairman; report to be submitted to annual convention at Del Monte, October 9-12, 1934.

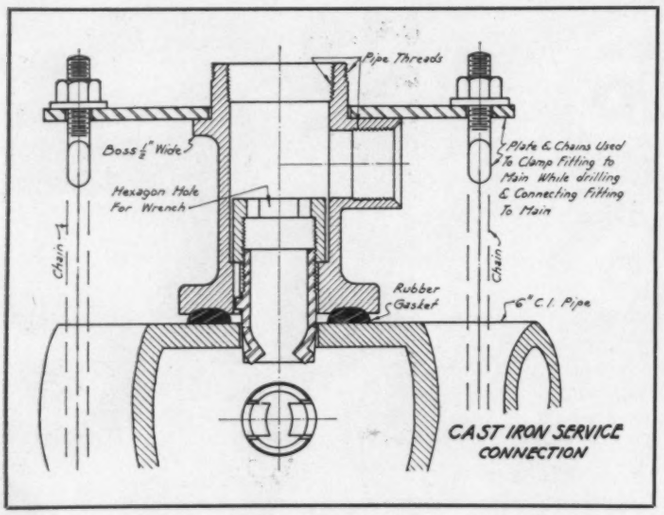

Pipe Threads
Boss 1" Wide
Hexagon Hole For Wrench
Plate & Chains Used To Clamp Fitting to Main While drilling & Connecting Fitting To Main
Chain
Chain
Rubber Gasket
6" C.I. Pipe
CAST IRON SERVICE CONNECTION

FIG. 3.

Newly designed mechanical service correction which may be attached to inside of pipe, and may be used on pipe of considerable graphitization.

pipe was breaking as a ring while the thicker pipe was breaking as a beam. (It may be shown mathematically that pipe of this size breaking as a ring will fail at a load of 50 to 70 per cent of that when breaking as a beam.)

The manufacturers then furnished us with pipe in various thicknesses and a demarcation point was determined where a pipe without service connection or drilled hole would break as a beam or ring; when a pipe was thin enough to break as a ring it was found that the heating effect of brazing did not further weaken the pipe, and that when it was thick enough to break as a beam the drilled hole through the pipe wall did not materially weaken the pipe as a beam until the hole was sufficiently large to cause the pipe to break as a ring.

We have shown in the tests that the same results could be obtained whether or not the pipe was free to expand or contract longitudinally but that when under an end thrust the strength was materially reduced after brazing. Except in this latter instance, it was found that brazing does not reduce the strength of the pipe, and any reduction in strength is due to the hole drilled through the service connection after the brazing is done. Apparently there is little justification for the old rule that cast iron pipe should not be tapped over one-fourth its nominal diameter on modern cast iron pipe unless it is because of the difficulty in securing enough threads or because of the wedging action of the threads into the cast iron. If this latter reasoning explains why this rule has been adhered to, the use of brazing or a mechanical fitting seems to be the solution for at least the larger size connections.

Impact tests were made by dropping a 25 pound hammer on the service connection parallel to the longitudinal dimension of the cast iron pipe. The hammer was raised ½-inch increments beginning at a height of ½-inch. Both 5-inch and 3-inch distances from cast iron pipe to point of applied impact were used. In these tests three kinds of brazing flux were used, that is, Purox, Brazo, and Peterson; the first two being products of the Linde Air Products Co., and the third of Peterson Co., Compton, Calif. and Kansas City, Mo. No. 10 and No. 25M Oxweld rods were used; the latter, having the advantage of being non-fuming, is thus recommended for field work.

It is quite evident that an impact test of this kind is an adhesion test to determine the bond between the cast iron and the bronze. Other things being equal the ability of the cast iron pipe to lend adhesion is also determined, and when the adhesion properties of the cast iron pipe and the bronze are sufficient to allow the cast iron pipe to break before the bond loosens, the tests again become a physical test of the cast iron pipe.

In the early part of these tests, it became quite evident that other things being equal, the strength of the bond between cast iron and bronze was dependent upon the area of bronze put on the cast iron pipe. Thus it was found that the bossed collars as furnished by the Pacific States Cast Iron Pipe Co. were insufficient in area to produce a strong connection.

Best results were secured by the use of a double bead weld with a band of bronze not less than ¾-inch wide. Purox and Brazo flux differed little in their adhesion qualities. Peterson Flux increased the adhesion tremendously allowing impact heights of 40 per cent to 50 per cent more than the others. While welds were tested under pressure without indication of leakage, the Peterson Flux gave a porous looking construction. It was found that this could be overcome by using the Peterson Flux for tinning and then reverting to the Purox. No loss in strength of bond was noted for this procedure. Here again the thin wall of the Mono-Cast pipe showed up in that the impact heights secured were lower than where thicker wall pipe was used. This does not detract from the value of Mono-Cast pipe and should only be considered as effect of thickness and tensile strength on any make of cast iron pipe, for as may be seen from the results the Mono-Cast pipe gave very uniform adhesion results and the lower impact heights shown are only because of pipe wall failure.

As a matter of fact, Mono-Cast and Pacific States pipe after being ground and/or filed to a bright surface produced excellent bonds, in many cases sufficient to severely bend the service nipple or even break out the side wall of the pipe. Considerable difficulty was experienced in obtaining a good bond with the Super-DeLavaud pipe until we ground into the pipe surface to a greater depth, presumably past the outside film of powder which apparently works its way into the pipe in the new process of manufacturing this pipe.

Fig. 1 and Fig. 2 pictorially show the results of the impact test. In one case the service connection may be seen cracked and bent while the bond between

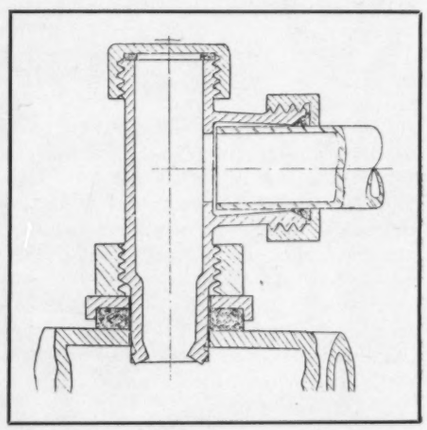


FIG. 4

cast iron and bronze is still intact, while in another case the cast iron pipe has given away from the force of impact on the service connection. Note the darkened areas around the bronze due to the presence of the Peterson Flux which is in itself a very dark grey material. Elsewhere in the two pictures may be seen points where the bronze weld has broken its bond away from the cast iron pipe.

Tests performed by the American Cast Iron Pipe Co. show that the cast iron fusion method of attaching services gives practically the same results as ob-

(Continued on Page 43)

Use *of* Indexes *or* Cost Translators *in* Utility Appraisal Work

By HARRY BARKER

Consulting Engineer, Vermont Public Service Commission

THE abandonment of engineering appraisals recently has been advocated by a few critics of the economist-statistician-accountant school on account of claimed variations between appraisal figures for the same property as made by different engineers, and because the resulting Commission or Court values differ from the engineers' figures. Simultaneously substitution has been sought of a quick and easy method of appraisal which in essence consists of applying some broad general-price index or translator to the last previous value established by authority and to the net additions (or net deductions) since. This situation warrants a study of the criticized engineering valuations, of the development of an adjudicated value from evidence, and of the proper use of indexes. It has not been difficult to convince Commissions and Courts of the fallacies of the proposed statistical substitute for engineering studies.

INADEQUACY of the general-price-index or translator short-cut method as applying to utility appraisals is discussed by Mr. Barker in these excerpts from his paper before the recent 12th Annual Conference of Utility Commission Engineers, held at Washington, D. C. He offers practical reasons for variation in engineering estimates, and in later portions of the paper, not published below, deals with the proper use of specific index methods in limited fields of utility appraisal work.—*Editor.*

Normal Variations of Engineering Estimates

An inventory and appraisal made by competent engineering force is (1) a catalog of counted property items and usually (2) a series of estimates of the cost of reproducing those property items (neglecting for this study, those appraisals which are distributions of authentic original costs over the corresponding property items). It is common experience that two contractors bidding on the same job may be close together or far apart in price. It is common experience that actual cost and prior estimates of construction differ more or less, and often more. There is nothing wrong with that sort of experience, so why be excited over two appraisals that differ in amount. The reviewing authority should be able to decide upon which to place greatest credence in taking due cognizance of explanations offered, degree of thoroughness shown, independence of attitude, freedom from conscious or unconscious influence, relative depth and breadth of experience, and perhaps other factors.

Moreover, in many cases relatively different appraisals could be brought into closer approach by conference. There should be eventually no question of the inventory; either the property items exist or they do not, and any two honest open-minded engineers can quickly settle such a question of fact. The cost of materials and apparatus should be similarly decided, for any engineer making a serious appraisal must expect to give a full disclosure of his price sources. There is genuine ground for different figures on cost of labor for construction, erection or installation, but two reasonable engineers being frank with each other ought to resolve some of their differences. Since such labor commonly is 40 per cent, say, of the direct cost of some property items the estimates of labor amount and cost can be 25 per cent apart and still affect the final total by only 10 per cent. Two independent appraisals that can be made to agree within 10 per cent are both acceptable as evidence assisting the reviewing authority to determine value.

There is reason to expect differences in the "overheads" or undistributed construction expenses which properly are to be taken into account. The more experience an engineer has had in construction, or supervision of construction, or in cost analysis of large construction, the more he is apt to appreciate that there may be honest conditions and circumstances which sometimes bring relatively high overhead burdens. Especially here, the reviewing authority has grounds for determining what figures deserve the greater credence. The total overhead burden sometimes may be, for example only, say 20 per cent on total direct cost—which is 16.6 per cent of total final cost. Overheads may vary 25 per cent and still affect the final cost only about 4 per cent.

The greatest variations in appraisals probably occur in respect to the much debated "going value" and "working capital." Both are elusive of exact definition, and estimates have had to follow rather elaborate hypothesis developed by the contending parties if the variant appraisals appear in a controversial case. Here particularly if the reviewing authority could formulate and enforce the guiding hypothesis, the different engineers probably would find and apply the needed facts with reasonably good agreement. Developing the proper hypothesis is more a matter of legal opinion and business sense than of engineering judgment.

There is no magic formula by which one and only one appraisal result is to be expected in a given situation. Apparently divergent appraisals can often be brought to reasonable agreement. When they cannot be harmonized they still are useful to the reviewing authority as evidence of value which can aid judgment.

Development of Adjudicated Value

The proposal mentioned at the outset, of finding present value by the formula of multiplying some prior established value by a general price index, or cost translator, etc., might warrant a little examination in regard to the present bearing of a value found 10, 15, or 20 years ago. That value was found by the exercise of judgment guided by certain evidence probably including estimated cost of reproduction, historical or book costs, and the expected immediate trend in cost of that kind of property. But the color of the picture as it was then is gone. The circumstances then affecting judgment have now changed. The reviewing authority has been replaced by a new

(Continued on Page 38)

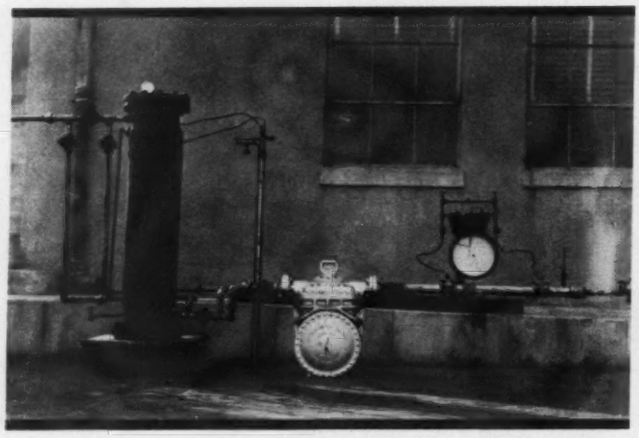


FIG. 1.

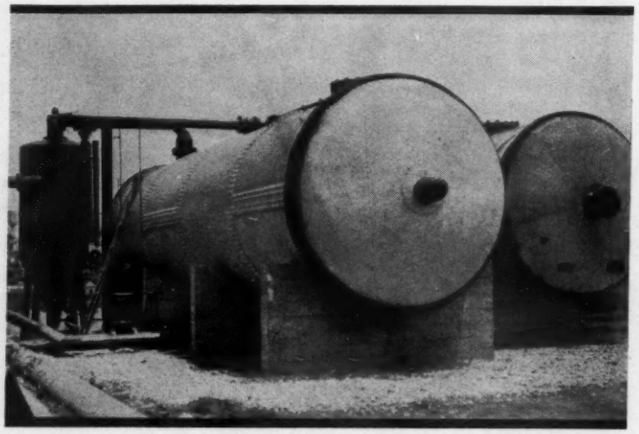


FIG. 2.

Purification of Natural Gas Small Quantities of

I. Introduction

THE presence of hydrogen sulphide in manufactured gas and in certain natural gases, and the destructive corrosive action usually accompanying it, have continually presented the gas industry with problems of purification.

The concentration of this material in unpurified manufactured gas amounts to from 50 to 500 grains per hundred cubic feet, varying with the kind of gas.[1]†

† See Bibliography, page 45, for references.

TABLE NO. 1. HYDROGEN SULPHIDE CONTENT OF DISCHARGE GAS AT DEL REY OIL AND GAS CO. ABSORPTION PLANT, TO SOUTHERN COUNTIES GAS CO.

Pressure 30-35 lbs. Gauge
(White's Cadmium Acetate Test Used[2]*)

Date	Time	H_2S Grains per 100 cu. ft.
12-12-33	2:10 p.m.	7.5
12-13-33	4:10 p.m.	2.5
12-22-33	.....	2.5
12-22-33	.....	3.0
12-23-33	3:30 p.m.	0.6
12-26-33	10:00 p.m.	0.6
12-26-33	1:30 p.m.	1.2
12-27-33	10:00 p.m.	6.0
12-27-33	12:00 noon	6.0
12-27-33	1:20 p.m.	10.0
12-27-33	2:30 p.m.	4.0
12-27-33	2:45 p.m.	3.4
12-27-33	4:30 p.m.	3.4
	Average	3.9

*With the aid of White's calorimetric tester it is possible to obtain an indication of the hydrogen sulphide in a gas passing a given point during the short time period of the test. This time will vary from a few minutes to several hours, depending upon the amount of hydrogen sulphide in the gas. If an average figure for the line is desired, it is perhaps better to use a method requiring continuous passage of the test gas for a day or more. An absorption method, using silver sulphate, has recently been described as useful for this purpose by Devine, Wilhelm, and Schmidt.[3]

Analyses of natural gases from various parts of the country have given values of from zero to 13,000 grains and over, per 100 cu. ft. California natural gas, usually spoken of as being free from hydrogen sulphide, has been found in the past to contain as much as three-tenths of a grain per 100 cu. ft. Even this small concentration has caused, under certain conditions, severe corrosion of pipe lines and equipment. The corrosion experienced by the lines of the Southern Counties Gas Co. serving Venice field gas will be shown to be due to hydrogen sulphide, present in quantities considerably in excess of the above figures for California gases, but which are to be considered but mere "traces" when compared with certain mid-continent natural gases or unpurified manufactured gas.

II. Amount of Hydrogen Sulphide in Gas

Soon after production of oil and gas was first started in the Venice field in 1930, the dry gas was tested and found to be free from hydrogen sulphide. Distribution of Venice gas by the Southern Counties Gas Co. was then started and continued until December, 1933. During this period it became increasingly evident that something was wrong with the Venice gas. Copper pilot tubes on warm air furnaces began to plug up and some internal corrosion of copper mains and services was encountered.

A second investigation of the hydrogen sulphide content was then made with the Union Oil Co. and the results shown in Tables No. 1 and No. 2 were obtained.

The hydrogen sulphide content of the gas coming from various wells in the south end of Venice field is shown in Table No. 2. The great variation in hydrogen sulphide content of gas from different wells is surprising.

From the above results, the variation of sulphur content from well to well as shown in Table No. 2, and the fact that a good many of the wells "head" only during short periods of each hour, it then seemed only reasonable to expect the hydrogen sulphide content of the gas leaving the Del Rey plant to undergo the wide fluctuations illustrated in Table No. 1.

In passing, it might be of interest to compare the hydrogen sulphide content of the Venice gas with gases from other well known California fields. Tests made in various fields, using either the White tester or an absorption method, are shown in Table No. 3.

The results of the hydrogen sulphide tests showed the Venice gas to contain a quantity of the impurity in excess of the allowable maximum,* and accordingly, on December 10, 1933, the Southern Counties Gas Co. discontinued taking Venice gas until it could be purified.

*The California State Railroad Commission has specified that gas for domestic consumption shall contain no more than a trace of hydrogen sulphide when tested by the lead acetate strip method. (Ref. 4, 5.) The sensitivity of this test is approximately 0.30 grains per 100 cu. ft. of gas. (Ref. 6.)

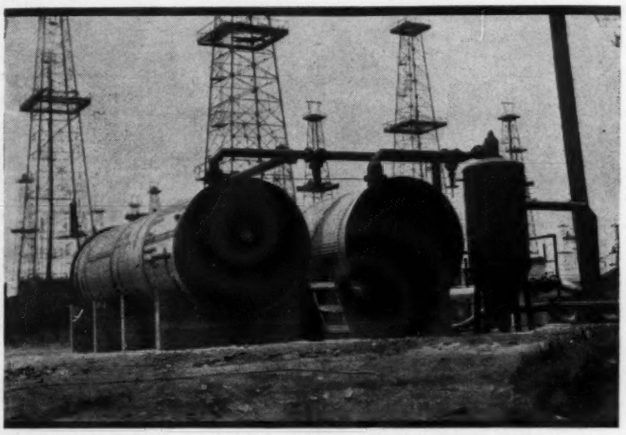


FIG. 3.

ILLUSTRATIONS show experimental unit (Fig. 1) and two views of purifier plant installed at Del Rey lease of Union Oil Co. in Venice, Calif., oil field. Plant removes hydrogen sulphide from gas prior to purchase by Southern Counties Gas Co.

Containing Hydrogen Sulphide

By ARTHUR B. ALLYNE

Chemist

*Southern Counties Gas Company**

III. VARIOUS PURIFICATION PROCESSES CONSIDERED

In selecting a method for purification of the Venice gas, several points required consideration. Little or no information was found concerning the design of purification equipment for gas containing such small concentrations of hydrogen sulphide as were shown to be present. The usual gas to be purified contains at least 100 grains of H_2S per 100 cu. ft., while the gas involved in this case averaged but 3.9 grains.

It was also necessary that the method to be selected must be economical, from the standpoint of both initial and operating costs, due to the small amount of gas to be treated, roughly 3,000,000 feet per day, and the uncertain length of life of the field.

A reasonable pressure drop through the purifier could be tolerated as the gas was reduced in pressure near the plant outlet.

Another point to be considered was the fact that the gas contained about 2.3 per cent carbon dioxide.

The small amounts of gas to be treated would also make it impractical to attempt to recover the sulphur released as a result of the purification.

With the above points in mind a search of the literature was made. As a result, the following processes were considered:

TABLE NO. 2. HYDROGEN SULPHIDE CONTENT OF VARIOUS WELL GASES IN SOUTH END OF VENICE OIL FIELD

Well Sampled	Date	Pressure or Vacuum	Producing M c.f. per day	Hydrogen Sulphide Grains per 100 cu. ft.
A	12-13-33	Vacuum	.....	7.5
B	12-24-33	Vacuum	650.0	1.3
C	12-23-33	Vacuum	See note	3.5
D	12-23-33	Vacuum	15.0	0.0
C	12-26-33	Vacuum	See note	5.0
F	12-22-33	245 lbs.	780.0	15.0
G	12-24-33	Vacuum	105.0	0.9
F	12-26-33	245 lbs.	780.0	15.0
H	12-23-33	Vacuum	80.0	Over 100.0
J	12-24-33	6 lbs.	400.0	54.0
K	12-23-33	Vacuum	40.0	3.4
L	1-9-34	Vacuum	50.0	0.0
M	1-9-34	Vacuum	200.0	13.0
N	1-9-34	Vacuum	35.0	3.2
O	1-9-34	Vacuum	35.0	0.0
P	1-9-34	Vacuum	17.0	54.0
Q	1-9-34	Vacuum	22.0	270.0
R	1-9-34	Vacuum	30.0	10.8
S	1-9-34	Vacuum	140.0	54.0

NOTE: Gas from F is discharged into C to circulate C. About 780 M c.f. enter C while its total output is about 880 M c.f. per day.

TABLE NO. 3.

Field	H_2S Content Grains per 100 cu. ft.	Year of Tests
Venice	0.00 -270.0	1933
Kettleman Hills	0.008 - 0.087	1932
Baldwin Hills	0.02 - 0.79	1928
Ventura	0.0077- 0.03	1934
Taft	0.08 - 0.32	1934
Signal Hill	0.031	1934
Santa Fe Springs	Negative	1934
Huntington Beach	0.15	1934

1. Seaboard soda ash. [1 7 8 9 10 11]
2. Organic bases-Triethanolamine. [7 12]
3. Lime and Salt solutions. [13 7]
4. Thylox process. [7 14 15]
5. Magnesium Hydroxide. [7]
6. Sodium Phenolate. [7]
7. Iron Oxide. [1 16 17 18]

Iron oxide purification, as used in manufactured gas practice for a number of years, was finally adopted as the most practical and economical of the methods considered for purification of the Venice gas. Equipment was available that could easily be converted and used for the installation, and the oxide material itself is relatively inexpensive. Finally, and possibly most important of all, the iron oxide mixture was shown to be capable of bringing the hydrogen sulphide content of the gas down to the desired concentration of 0.3 grains or less.

IV. DESIGN OF OXIDE PLANT

When the iron oxide process was first considered, attempts were made to determine the amount of purifying material that would be required. Preliminary calculations, using Steere's formula [19], made this process appear impractical, indicating an amount of oxide many times in excess of the quantity finally determined experimentally. The Steere formula is as follows:

$$A = \frac{G \times S}{3000 \times (D\ C)} \quad - - - - - \quad (1)$$

Where:

A = Cross section area in sq. ft. of oxide bed through which gas passes.

G = Maximum amount of gas in cu. ft. at 60°F. to be purified per hour.

S = A factor depending upon the H_2S content.

*A paper originally presented at Spring Technical Conference, Pacific Coast Gas Association. March 22-23, 1934. Revised to September 1, 1934.

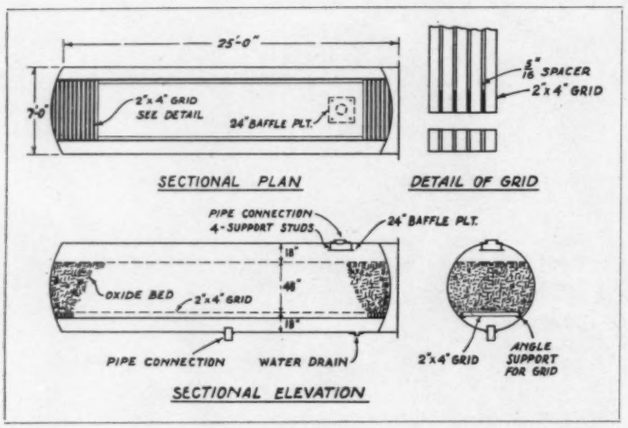


FIG. 4.

Detail of oxide treater for removal of hydrogen sulphide from natural gas.

D = Total depth of bed in feet.
C = A factor, depending upon the number of boxes used.

It seemed probable that this formula would not apply to our conditions since they differ so widely from those upon which the formula is based. Consequently a small experimental purifier, designed to operate under our field conditions, was built to determine the quantity of oxide that would actually be required.

The experimental purifier is shown in Fig. 1. It was constructed of a 5-foot piece of 12-inch pipe, flanged at both ends, which held a 44-inch bed of oxide material. The gas passed downward through the bed; however, connections were available to reverse the flow, if desired.

By varying the gas flow through the purifier and taking lead acetate tests on the outlet gas it was possible to roughly determine the capacity of a bed of oxide, 4 feet in depth, treating water-saturated gas at 30 lbs. pressure, with a hydrogen sulphide content of approximately 4 grains per 100 cu. ft. The results are shown in Table No. 4.

From these results it was concluded that 1100 standard feet per hour was the maximum amount of gas under these conditions that could be properly purified for each square foot of oxide bed. (A figure of 800 standard cu. ft. of gas per hr. per sq. ft. of oxide bed—bed 4 feet deep—was used in the design of the large purifier.)

The pressure drop across the bed at the above rate was found to be 0.3 inches of water.

Upon removing the top flange of the small purifier, it was found that the oxide had shrunk considerably. The 44-inch bed had settled 6 to 8 inches and also there was a channel all the way around the outer edge of the bed. This permitted some gas to pass through the purifier without intimately contacting the oxide. If a large percentage of gas was so by-passed it would obviously defeat the purpose of the purification.

Shortly after the completion of the experimental work, an English article[18] on purifier design was obtained which offered a formula for calculating the required amount of oxide for gas of any sulphide content.* This formula is as follows:

$$R = \frac{4050\ \sqrt{S}}{F\ W} \quad - - - - - - \quad (2)$$

where:

R = Volume of oxide required per M c.f. of gas per hr.
S = Hydrogen sulphide content, grains per 100 cu. ft.
F = Active iron content of oxide, per cent.
W = Bulk density of material, lbs. per cu. ft.

Substituting in the above, the values for our conditions gave:

$$R = \frac{4050\ \sqrt{3 \times 3.9}}{30 \times 25} = 18.48 \text{ cu. ft of oxide required per M c.f. of gas treated per hour.}$$

Since the volume of gas treated per hour is

$$\frac{1{,}000{,}000}{1{,}000 \times 24} = 41.6 \text{ M c.f.}$$

The total amount of oxide required is

$$18.48 \times 41.6 = 768 \text{ cubic feet.}$$

This amount is slightly in excess of the figure of 660 cubic feet, based on our experimental work.

It should be observed that the above computation involves a hydrogen sulphide content of three times the assumed content of the gas (3.9 grain per 100 cu. ft.) and a rate of flow of ⅓ the actual rate. This is because the gas is assumed to be under three atmospheres absolute pressure in the purifier.

The volume of oxide calculated above is sufficient to purify gas containing a maximum of 3.9 grains of H_2S. In order, however, to prevent dirty gas from ever leaving the plant, it is necessary to provide an amount of oxide that will completely purify gas containing the peak concentration of hydrogen sulphide. Although it was known this peak concentration exceeded 3.9 grains, a unit was installed based on this amount of impurity in the gas. After several months' operation, it was found that there were periods when the exit gas was not sufficiently purified and a second unit was installed to operate in conjunction with the first one. The additional unit nearly doubled the total amount of oxide in the treaters. Formula No. 2 indicates that this amount of oxide is sufficient to purify three million feet of gas per day containing 14.2 grains of H_2S per 100 cu. ft.

*This formula is based on the work described in reference No. 16 in the Bibliography.

V. Description of Plant

With the aid of the information obtained from the experimental work, the purification plant was designed and constructed by the Union Oil Co. The cost of this plant was shared by the three oil companies whose gas was to be treated therein.

TABLE NO. 4.

Gas flow—Standard cu. ft. per hr. per sq. ft. of oxide bed. Gas at 30 lbs. gauge pressure. Depth of bed 48 in.	Standard Lead Acetate Test
2250	Positive
1545	Positive
1420	Positive
1270	Trace
1100	Faint trace
900	Negative

The purifiers are shown in Fig. 2. The combined volume of oxide in the two absorbers is 1,465 cubic feet. A water separator for the inlet gas is shown on the left of the absorbers.

Fig. 3 is a view from the opposite end.

Details of one of the purifying units are shown in Fig. 4. The shells used were salvaged from gasoline absorption towers. The oxide material is laid on a removable wooden grid flooring, held in place by two welded angle supports running the length of the absorber. Passage of the gas is permitted by spacers placed between each 2- x 4-inch grid.

The purifying material is handled by removing the 7-foot flange dished head from the end of the absorber. The removable flooring aids in charging and dumping the material, as it permits standing while working in the interior.

Reactification of the oxide is accomplished in place by the introduction of approximately 2 per cent of air into the unpurified inlet gas. The unpurified gas is saturated with water vapor when it leaves the compressor plant and therefore no humidity control or treatment is required.

The inside of the absorbers is coated with a bituminous material to prevent excessive corrosion.

Fig. 5 is a flow sheet of the purifica-

(Continued on Page 44)

DISTRIBUTION

AMONG the abstracts in the following pages will be found several covering papers to be presented at the Pacific Coast Gas Association's 41st Annual Convention, which will be in session at Del Monte, Calif., October 9-12. Two additional features in this issue are pre-printed from the same program—the paper by H. S. Harris on "Service Connections to Cast Iron Pipe," Page 11, and that by Arthur B. Allyne on "Purification of Natural Gas Containing Small Quantities of Hydrogen Sulphide," Page 14.—*Editor.*

Effect of Humidity on Meter Proofs

● **GUY CORFIELD, Los Angeles Gas and Electric Corp., in paper to be presented at Pacific Coast Gas Association Annual Convention, Del Monte, Calif., October 9-12, 1934—(Abstract):**

IMMEDIATELY after the introduction of natural gas into Los Angeles a very considerable increase in fast meters was evident; seven months later humidification was commenced, by means of steam, and has been continued up to the present time. A gradual and very gratifying improvement in meter proofs has been realized.

Guy Corfield

As a result of this variable meter registration a broad investigation was instituted to try and determine what factor or factors control meter performance. Every phase of meter mechanics was examined, and it was very strongly indicated that all major variations in accuracy could be traced to the leather diaphragms of the meters, and that the diaphragms themselves could be influenced and perhaps controlled by the humidity of the gas. It was decided to conduct further research on the matter, and the following discussion gives the status of this research to date.

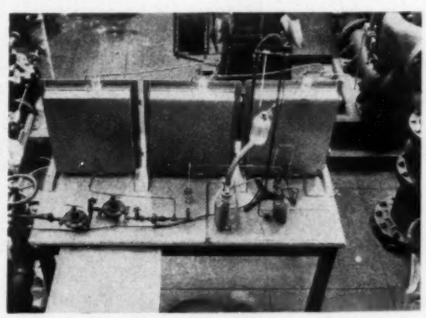
Considering the consumer's meter, we find that it operates under constant pressure but varying temperature. Considering, again, the effect of humidity on organic substances such as leather, or on the domestic operation of drying clothes, it will be realized that it is *relative humidity,* and not percentage humidity, which controls drying.

Applying this conception to our meter diaphragm situation, it appears that our goal is not to maintain a constant proportion of water vapor to gas (absolute of percentage humidity) but to maintain a constant relative humidity with respect to meter temperature. This would mean that we should have more water vapor in our gas in the summer than in the winter; if it be found possible to expand the refinement to perfection, we should have more water vapor in our gas in the heat of the day than in the cold of the night. It also appears that prover room humidity, and prover humidity, should be controlled to the same value as the gas, as otherwise the proof will not be representative of field operation.

Eleven different meter leather samples were obtained, as follows:

Tannage	*Treatment*
Hemlock	Oiled
Semi-chrome	Oiled
Hemlock	Non-oiled
Semi-chrome	Non-oiled
Semi-chrome	Special oil
Bark tan	Oiled
Bark tan	Oiled
Bark tan	Non-oiled
Chrome retan	Oiled
Chrome retan	Oiled
Chrome retan	Non-oiled

Six strips have been prepared from each of the 11 samples of leather listed above, and are being tested for shrinkage or expansion, vs. humidity, as follows:



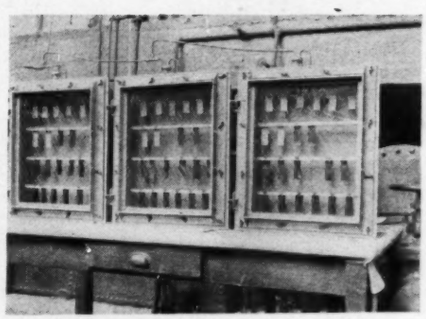


FIG. 1.

The leather was marked at points approximately 2 inches apart, using ink lines for the non-oiled samples and small pin-prick holes for the oiled samples. Samples were then divided into three sets of 22 strips, each set containing duplicates, and each set placed in a humidity control box, hung on wooden bars by means of the upper part of a copper hook. These control boxes are glass front boxes through which gas at controlled humidity is passed. The glass fronts are removable, to permit measurement of the strips, the procedure being to momentarily open the front, remove the strip, rapidly measure, and replace. This momentary exposure to air of a probably different humidity will not introduce a measurable error. Measurements are made with a steel rule graduated to hundredths of an inch. Gas is always flowing into the box.

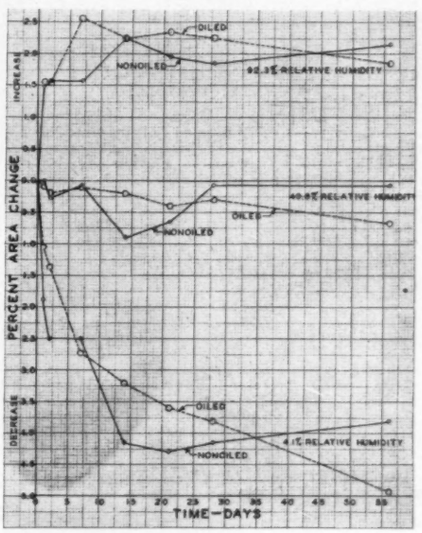


FIG. 2.

The humidities maintained in the three boxes are approximately 4%, 40% and 92%.

Fig. 1 shows the three containers.

The results obtained from this test, to date, are shown in Fig. 2, as averages for each treatment of leather (oiled or non-oiled) and for each humidity. Thus each "oiled" line shows average values for 14 oiled specimens, and each "non-oiled" line average values for eight non-oiled specimens. All the specimens were kept and prepared in the normal

laboratory atmosphere and so were all at the same equilibrium with respect to water vapor, when placed on test. It will be seen that the specimens maintained at 40.8 per cent R. H. changed to the extent of only a slight shrinkage; those at 4.1 per cent R. H. shrank rapidly, approximately 4 per cent in area; those at 92.3 per cent R. H. expanded rapidly, approximately 2 per cent in area; all this over a period of 55 days.

The only controlling factor seems to have been relative humidity, at least so far. The origin, tannage and treatment of the various leathers seem to have had no selective influence. It does not even appear that the oiled leathers are slower in coming to equilibrium, or less susceptible in any way. It will be noticed that the "oiled" specimens in 92.3 per cent R. H. seems to be decreasing from their peak expansion; also that the "non-oiled" specimens in 4.1 per cent R. H. are increasing from their peak contraction. We have no explanation for this seemingly unexpected behavior. The relative humidities have been very constant, with no increasing or decreasing trend. The average atmospheric temperature surrounding the boxes has also been very constant.

A new series of tests are also being made on meters equipped with diaphragms similar to the test strips already described, run on controlled gas at the same three relative humidities, and passing 30 cubic feet per hour.

Controlling Leakage in Cast Lead Joints

● **W. F. PAPE, Pacific Gas and Electric Co., San Francisco, Calif.; addressing Organization Conference, Pacific Coast Gas Association.—(Abstract):**

LEAKS in cast lead joints on cast iron pipe have been a source of trouble and expense to gas companies, particularly where a change has been made from moist to dry gas. This report deals with mitigation of this leakage by the use of a patented concrete joint.

W. F. Pape

The theory of stopping gas leaks with concrete joints is based on the following facts:

(1) Concrete and iron have the same coefficient of expansion.

(2) Concrete shrinks and bonds to iron (bond value equals 60 to 100 pounds per square inch).

(3) Concrete will be impervious to water pressures of at least 30 pounds per square inch for a mix of a properly designed density. (Minimum strength of 1000 pounds per square inch at 24 hours.)

(4) Waterproof concrete has a minimum of voids and only fine capillary tubes through which gas can permeate.

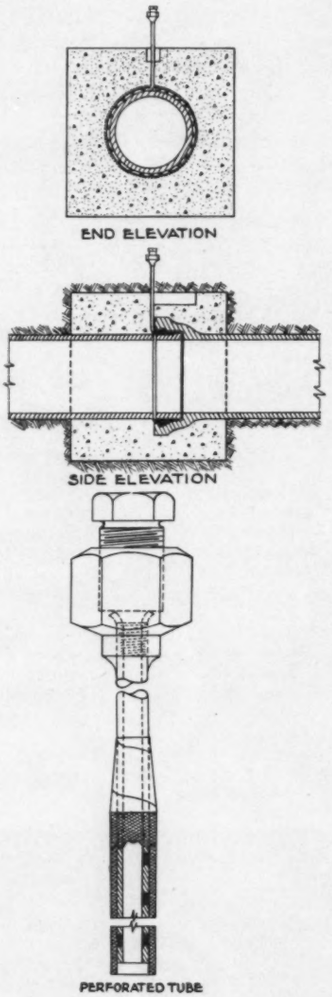


FIG. 1.

Use is made of the above facts to build a concrete block which is bonded to the pipe. The capillary tubes are closed by a sealing fluid, released at the space adjacent to the face of the bell, by the following method:

(a) A perforated ⅛-inch copper tube, with holes, No. 40 M.T.D., at 1 inch, on center, for a length equal to the circumference of the cast iron pipe, is placed around the face of the bell, with holes facing caulked joint, prior to the pouring of concrete. It is securely tied in place, in such a manner that the tube extends through the top of the concrete (See Fig. 1). The perforated length is covered with a porous cotton sleeve which serves as a continuous distribution medium for the sealing fluid. It also prevents cement from clogging the perforations. The end of the tube (extending above the concrete) has a ⅛-inch pipe fitting to which to connect an Alemite gun.

(b) A soap emulsion is forced, under high pressure, (above 500 pounds per square inch) through the tube with an Alemite gun. This emulsion is made by stirring 12 ounces of Ivory soap chips into three quarts of water and boiling until clear. Used when cool. This so called hypo-sealing is done after the concrete has attained sufficient strength to withstand internal pressure. This soap, which is a sodium stearate, reacts with the calcium silicates in the cement to form sodium silicate. Both these compounds are effective in closing up the capillary tubes and voids in the concrete permanently. This sealing action results principally from the formation of the calcium stearate or metallic soap, which is a plastic sticky substance, completely insoluble in water.

A few details relative to the concrete mix follow:

Field mix	1 : 2.36 : 3.18
Mixing water (approximate)	6 gal. per sack; 2.2 gal. (in aggregate) plus .42 gal. (absorption).
Field mix (cu. yd. batch)	4.22 gal. per sack
Water (approximate)	27.5 gal.
Yosemite one-day	6.6 sacks
Niles top sand	15.6 cu. ft.
Gravel (¼ in. to 1¼ in.)	21.0 cu. ft.

A test was made to determine the comparative strengths of cast iron pipe and a joint made of concrete of the above design. The concrete joint broke at 40,000 pounds and a piece of 6-inch C. I. pipe loaded under same conditions broke at 45,000 pounds.

Quite often, due to traffic conditions, weather, etc., it is necessary to backfill and close excavations, on the same day concrete is poured. By the use of 4 per cent (by weight) of calcium chloride, in concrete mix, soap emulsion may be forced into block 4 hours after pouring. The excavation may then be backfilled and tamped.

From July 1, 1931 to March 1, 1934, over 16,000 of these joints have been installed on cast iron mains ranging in size from 4-inch to 30-inch.

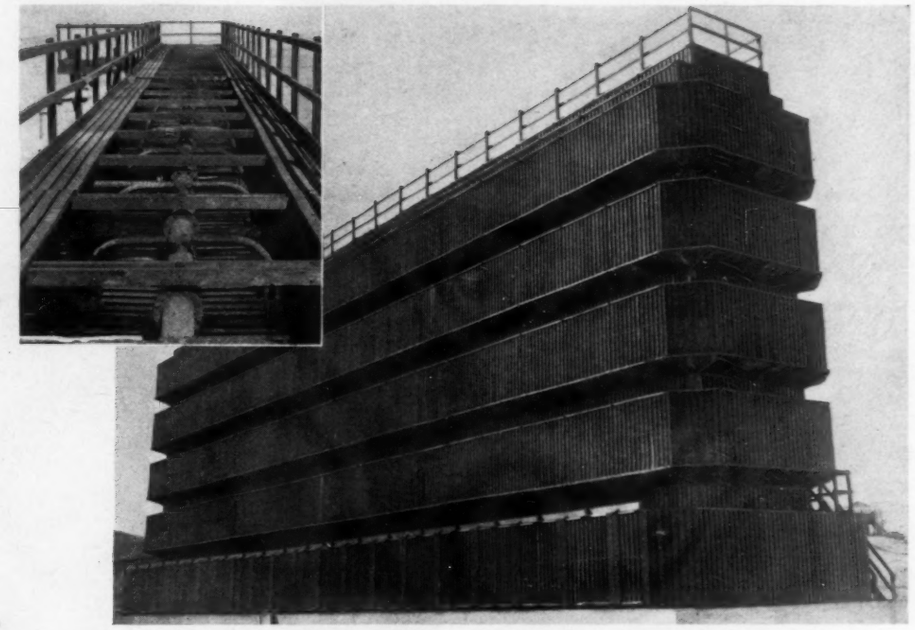
A great number of these joints have been subsequently inspected and, with a few exceptions, have shown no evidence of leakage. Several joints have been broken open and the soap emulsion was still soft and jellylike, indicating that were it necessary, additional soap emulsion could be injected into the concrete block to stop leakage.

Cases arise where space restrictions, due to adjacent substructures, are such that full dimensions of concrete blocks

FLUOR

builds the first tower to be used *exclusively* for

dehydrating natural gas



• *New Fluor Cooling Tower used for dehydrating natural gas exclusively, with insert showing primary distributing system of the low pressure, splash type employed in Fluor Aerator Cooling Towers.*

Date	Time	Inlet Temp. Gas	Outlet Temp. Gas	Water Temp. Bottom Tower	Atmos. Wet Bulb Temp.	Atmos. Dry Bulb Temp.	Wind Velocity M.P.H.
Aug.	9 a.m.	91.5	63°F.	61°F.	59°F.	69°F.	5.8
15	12 N	98.5	67°F.	65°F.	64°F.	82°F.	7.83
1934	3 p.m.	100.5	70°F.	66°F.	64°F.	89°F.	7.2
Aug.	9 a.m.	95.5	65°F.	63°F.	62°F.	83°F.	3.9
16	12 N.	97.5	66.5°F.	64°F.	64°F.	90°F.	7.7
1934	3 p.m.	99.5	68°F.	64°F.	64°F.	96°F.	10.5
Aug.	9 a.m.	101.	69°F.	66°F.	65°F.	83°F.	Calm
17	12 N.	101.	68°F.	63°F.	62°F.	94°F.	8.8
1934	3 p.m.	100.5	69°F.	64°F.	64°F.	100°F.	19.0

A few years ago they said it couldn't be done! But at left are figures from records of the company for whom this new Fluor installation was made, proving that water can be cooled constantly to within 2° of wet bulb temperature, regardless of wind velocities. Reports from the above company state also that sufficient vapor is being removed from the transmission line so that it is now bone dry; furthermore it is expected that it will remain so the year round.*

Read the record at the left—these figures speak not only for the effectiveness and perfected engineering design of this new Fluor tower but also for the flexibility and capability of the Fluor organization, in serving the gas industry with complete designing, engineering and structural services.

Full details are available from Fluor engineers.

***This type of dehydration plant is practical only in locations where pipe line temperatures will not be lower than 55° F. during winter months.**

FLUOR CORPORATION, LTD.
909 East 59th St. Los Angeles

• *The Fluor Corporation designs, engineers and constructs mechanical refrigeration dehydration plants for use with natural gas.*

FLUOR COOLING TOWERS

are not possible. The thickness of the concrete blocks may be reduced in one of the dimensions and a steel wire netting used as a reinforcement to impart the necessary strength to the block.

When substructures contact the pipe joint and prevent casting the block around the joint, it is often possible to include both pipe joint and substructure in the concrete block.

TRANSMISSION

Dehydration by Ammonia Refrigeration

● **C. S. POOL, Industrial Fuel Supply Co., Los Angeles, Calif., in report of Internal Corrosion and Dehydration Committee, Pacific Coast Gas Association; topic "Gas Dehydration by Refrigeration Using Ammonia as Refrigerant"; to be presented at Annual Convention, Del Monte, Calif., October 9-12, 1934.**

AT the Industrial Fuel Supply Co.'s Ventura Compressor Plant the gas dehydration plant using ammonia as the refrigerant* has been in continuous operation since approximately August 1, 1933.

C. S. Pool

A view of all the equipment except the compressor, ammonia condenser, and ammonia receiver is shown in Fig. 1. At the extreme left can be seen the automatic by-pass motor valve; next are the two gas heat exchangers; in the lower right is the scrubber preceding the chiller, and just above is the scrubber following the chiller. The two chilling units are at the upper right, one above the other, with the ammonia return control valve shown at the top on their left.

With one or two exceptions, this equipment has fulfilled all expectations. Although an outlet temperature of 50° F. was expected for the chilled gas, it has not been possible to operate continuously with a temperature below 54° F. At times when a temperature below 54° F. was maintained, there formed in the chiller tubes, an "ice" which caused excessive pressure drop against the unit, causing the automatic by-pass valve to open. This "ice" may be the same as has been experienced in other fields when refrigerating gas at approximately the same pressures, 420 pounds gauge, and which has been referred to as hydrocarbon hydrate. Although the temperature of 54° F. has been sufficiently low to prevent the formation of any condensate in the transmission lines (the lowest ground temperature of which the operators have records being 55° F.) the writer is of the opinion that extreme care should be used in the design of equipment of this type, especially as to the elimination of any "cold spots" in the chiller, such as might exist at the point where liquid ammonia enters and vaporizes.

The installation referred to has a maximum capacity of 40,000 M c.f. per day at 400 pounds gauge. The limiting factor as to capacity to date has been the ability of the scrubber immediately following the chiller to remove all mechanical water. At volumes in excess of 40,000 M c.f. per day, there has been evidence of mechanical water carry-over. There is sufficient cooling capacity for a volume of 50,000 M c.f. per day, and steps are being taken to provide scrubbing capacity for the larger volume.

Inasmuch as the plant under discussion has been in operation only one year, it is not possible to state accurately the cost per M c.f. treated. However, considering all available information and taking into account interest at 5 per cent on capital, depreciation, taxes, and proportionate share of labor, fuel, oil, maintenance, miscellaneous expense, insurance, and an estimated amount of $100 per year for ammonia make-up, the cost thus far per M c.f. treated has been .424 mills with a total volume of 13,868,000 M c.f. through the plant.

Because of the recognized need for lowering the dew point of gas entering transmission lines to a point below the temperature of the ground, this installation is being watched with interest, especially in comparison with other methods of dehydrating gas.

*A detailed description of this plant may be found on Page 83 of the 1933 Proceedings of the Pacific Coast Gas Association.

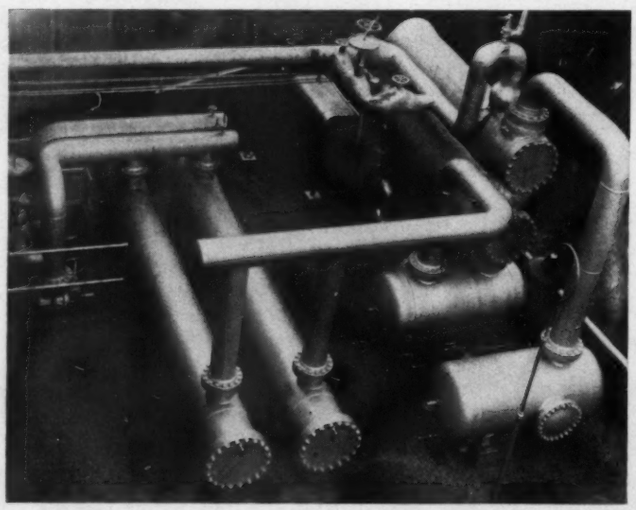


FIG. 1.

Equipment at the gas dehydration plant of Industrial Fuel Supply Co. Plant uses ammonia as refrigerant.

Fulton, Mo., Gets PWA Grant for Municipal Gas Plant

The Public Works Administration has granted Fulton, Mo., a loan of $98,500 for the erection of a municipal gas plant. Formal application for the loan was filed late in 1933 with the proviso that the Panhandle-Eastern Pipe Line Co. be instructed by the Missouri Public Service Commission to furnish the city gas. The Missouri Public Service Commission ruled in favor of the city, and the Panhandle-Eastern Pipe Line Co. filed an appeal to the Missouri Supreme Court, questioning the jurisdiction of the Public Service Commission.

American Gas and Power Under New Control

According to September reports a syndicate headed by F. W. Seymour, president of the American Gas and Power Co., New York, has acquired control of the company through the purchase of 51 per cent of the voting stock of the Community Gas and Power Co., holding company for the American Gas and Power Co. The holdings were purchased from the estate of the late A. E. Fitkin.

Minnesota Utility Adds to System

Minnesota Valley Natural Gas Co. St. Peter, Minn., has secured franchises to serve natural gas in the villages of Lonsdale and Kasota, Minn., for a period of 25 years.

During the past 12 months

2 MILLION MCF

were added to the annual national load by the sale of

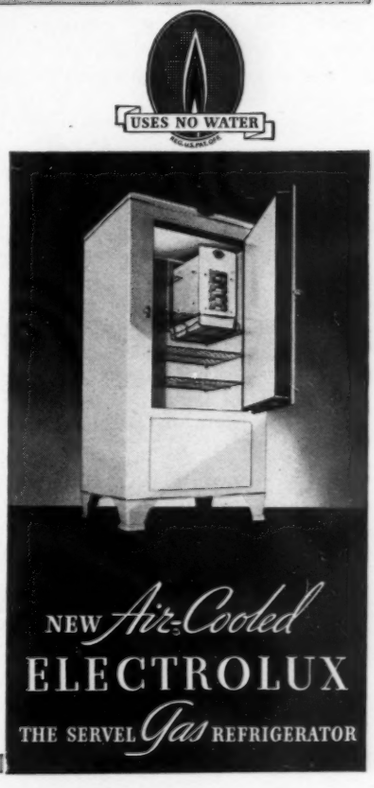
ELECTROLUX!

Did you get your share of this valuable increase?

Thanks to splendid cooperation of the gas industry, the past year has seen thousands more Gas Refrigerators installed on the lines throughout the country. This has meant an important permanent addition to the national load—greater, in fact, than the combined yearly consumption of 4 cities the size of Savannah. Yet this load increase—valuable as it is of itself—is but part of the real importance of gas refrigeration to the gas industry and to every individual company.

For, today, in the trying and uncertain times through which we are passing, one thing of vital consequence to every utility in the country is the *good will* of its customers. To maintain and augment this, means keeping the public sold on the service which it receives. The opportunities which gas refrigeration affords to publicize the greater usefulness and dependability of gas . . . to publicize, too, the modernity of gas as fuel . . . have been appreciated by officials of the great majority of the leading gas properties.

To these companies—as well as to all other companies—the manufacturers of Electrolux offer fullest cooperation in the active promotion of gas refrigeration in their territories. For merchandising and sales help, get in touch at once with Electrolux Refrigerator Sales, Inc., Evansville, Ind.



INDUSTRIAL USE

Efficient Gas Use in High Pressure Boilers

• **E. H. ADLER, San Diego Consolidated Gas & Electric Co., in report of Committee on Commercial and Industrial Heating Applications, Pacific Coast Gas Association; to be presented to Annual Convention, Del Monte, Calif., October 9-12, 1934.—(Abstract):**

THE ability to describe and recommend all the details of design and installation necessary for an efficient gas burner application will go a long way toward establishing the customer's confidence in fuel which we have to sell, and in the savings which are represented to him as arising from its use. This discussion has to do with some specific problems encountered in the design, installation, and operation of gas burners in high pressure boiler settings. Each boiler encountered presents its own problem of conversion, but the various ones in use today divide themselves into types, under the main classes of fire tube and water tube.

The most usual fire tube is the horizontal return tubular. This type is fairly flexible if load variations are not too sudden, but with large volume of water; main body of boiler comparatively cheap, but requiring expensive and permanent brick setting; operates up to 300 per cent rating; extremely rugged and fairly efficient.

Most other types of the fire tube boiler may be classed as portable, as requiring only a small amount of permanent brickwork. These types have lower overall efficiency than the h. r. t., but lower first cost; present a problem of limited furnace volume, and overloads limited to 250 per cent rating; mainly adaptable to steady firing at normal rating or less; stack losses are generally somewhat excessive at overloads; to obtain maximum possible efficiency should be well insulated and properly fired.

Water tube boilers divide themselves into horizontal or vertical tube types; carry much smaller volume of water than fire tube boilers of similar rating, being therefore much more responsive to variation in load conditions; in general, are easily capable of taking 300 per cent of rating on over loads; usually brick set and because of increased circulation and other features considerably more efficient than same sized fire tube boilers; in some instances extremely limited in furnace volume.

Furnace design should receive first consideration in changing any boiler to gas firing. First consideration always is to secure a fire box of ample volume, high enough to prevent direct impingment of flame against the crown-sheet, shell, or tubes. The old rule-of-thumb procedure is to allow 1 cubic foot of fire box volume for each boiler horsepower developed, or 1 cubit foot for each 45,000 B.t.u. delivered. Under some conditions and in some types this volume is impossible; with proper firing conditions, such as high pressure gas in venturi type burners with, at times, some tunnel construction which will speed up combustion, 65,000 B.t.u. per cubic foot can be efficiently introduced.

All portable type boilers present the problem of very limited fire box area. Increased furnace volume can be obtained by building a brick base of sufficient height to give the cubical content desired; using a corbelled wall to turn the flame and allowing it to travel twice across the fire box; using checker brick walls for the same purpose; for Scotch Marine type, building a large arched brick fire box with throat leading to the Morrison tube or attaching circular dutch oven of same outside diameter as Morrison tube.

With permanent brick settings, use as much new brick as possible to cut down air infiltration. Ventilate the floor with hollow tile underneath the fire brick and insulated brick. If the floor is deepened to give larger furnace volume, be careful to insulate the concrete footings. In general, use insulation whenever possible, and be sure that air openings into boiler room are adequate for burner consumption.

Burners divide themselves into venturi, multiple-jet and blast types, the first type inspiring primary air, the second depending principally on normal furnace draft and the third relying almost entirely on normal or forced draft, being used principally for very large boilers. Choice of burners depends on capacity, fire box volume, draft available, direction of travel of flue gases, and whether the furnace is to be fired front or back-shot. Experience shows it best to fire in direction of flue gas travel, and never back-shot a job unless circumstances absolutely demand it.

Puffing or vibration is always caused by flame speed, which is a function of air-gas ratio and fire-box temperature; it is sometimes due to eddy currents arising from pockets or sharp turns in the brickwork.

Retarders are recommended for all fire-tube boilers where draft conditions will permit. They materially increase heat transfer and often reduce stack temperatures 150 degrees. For Scotch Marine boilers, venturi burners on high pressure gas may be advantageous in obtaining overload capacity and eliminating vibration. On locomotive type the burners should be up-shot if possible and operating at high enough pressures to deliver high B.t.u. per cubic foot. If rapid change to oil is necessary, straight-shot burners are the only possibility but they should be back-shot for maximum flame travel.

H.r.t. boilers present a relatively simple problem. Full use of the furnace should be made by using wide, or several, burners, firing low and straight-shot from the front. Water-tube types receive very similar treatment. For the reason that these boilers are usually large and operating at a high per cent of rating, burner selection should be very carefully made and proper baffling not overlooked.

Who is a Logical Gas Engine Prospect?

• **C. Remschel, Power Engineer, Southern Counties Gas Co.; a paper to be presented at the Pacific Coast Gas Association Annual Convention, Del Monte, Calif., October 9-12, 1934—(Abstract):**

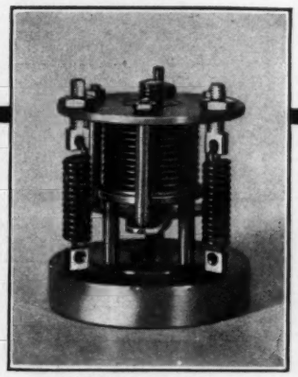
ANY power user who by changing to a gas engine, can pay for his investment from savings in operating costs within a reasonable time—not to exceed five years—is a logical gas engine prospect. The greater the rate differential and the better the load factor, the sooner will savings pay for the gas engine investment.

C. Remschel

Gas engine prospects fall principally into three classes—agricultural, industrial, and municipal. Load factor and other characteristics of various special types of engine prospects are indicated below.

Irrigation Pumping: This use requires long hours of operation per season and shows correspondingly good load factor; in the case of mutual water companies, which operate on an average of 3,000 to 4,000 hours per season, the annual load factor is 40 to 60 per cent

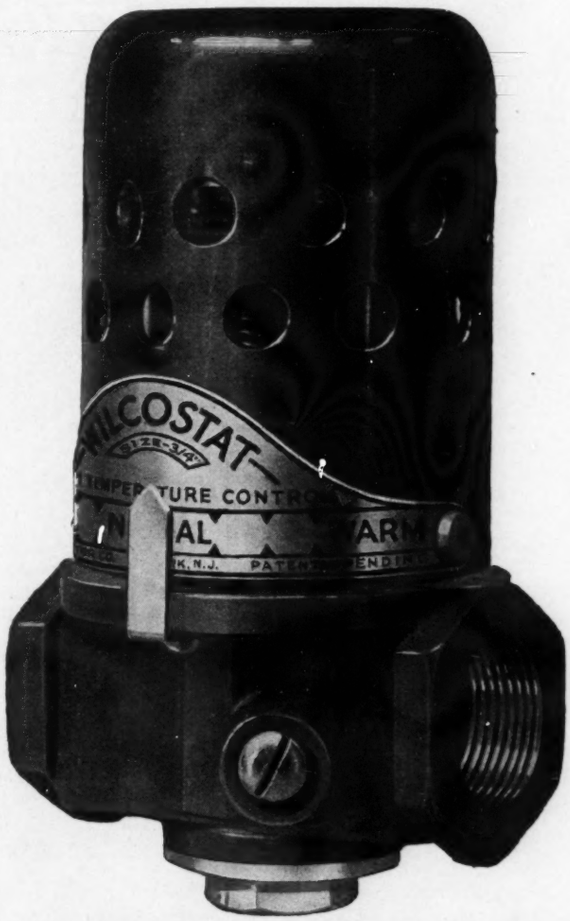
Decorative Cover
Liberally ventilated to insure free circulation of air at actual room temperature. Attractive lines. Easy to keep clean.



Sensitive Bellows Thermostat
Complete assembly unit of balanced construction. Protected against abuse or straining due to over-expansion. Large movement per degree of temperature change. Responds instantly to change in temperature.

Heavy Valve Casing
Accurately machined. High pressure type valve rod. Serves as base for assembly of complete Wilcostat. Incorporated by-pass adjustment and pilot light-outlet.

Self Aligning Valve Construction
Easily removed for cleaning, if necessary. Large capacity with extremely low pressure drop.



These Features Emphasize the Superiority of

THE WILCOSTAT

Automatic Room Temperature Control

THE WILCOSTAT Automatic Room Temperature Control for gas-fired circulators maintains room temperature within 1 F. of any desired temperature between 55° and 85°. It is a simple, complete and self-contained thermostat whose four main parts are illustrated above.

It requires no electric connection or flexible gas piping. *Its operation is not affected by variations in temperature of the gas supply.* Has an unusually low pressure drop. Economical to install on new or existing heaters.

Low initial cost. No maintenance. Obtainable in ⅜″, ½″ and ¾″ pipe sizes. Prices on application.

West Coast Distributors—H. R. Basford Co., San Francisco and Los Angeles, Calif.

THE WILCOLATOR COMPANY, Newark, N. J.

Specialists in Temperature Control for Household Appliances

TABLE NO. 1. COMPARATIVE COST OF OPERATION WITH ELECTRICITY AND GAS.

Kw. Hrs. based upon 90 per cent motor efficiency; M c.f. based upon 10 cubic feet of 1100 B.t.u. gas per horsepower hour; Cost based upon rates now in effect in southern California.

Monthly Hours of Operation	Monthly Cost of Operation					
	25 H.P.	50 H.P.	100 H.P.	160 H.P.	200 H.P.	300 H.P.
100 Electric Kw. Hrs.	2,075	4,150	8,300	13,280	16,600	24,900
Cost	$37.35	$86.40	$147.29	$235.66	$294.58	$418.95
Gas M c.f.	25	50	100	160	200	300
Cost	$11.25	$22.50	$38.00	$60.80	$76.00	$114.00
200 Electric Kw. Hrs.	4,150	8,300	16,600	26,560	33,200	49,800
Cost	$73.17	$129.70	$217.32	$347.71	$434.64	$680.40
Gas M c.f.	50	100	200	320	400	600
Cost	$22.50	$45.00	$76.00	$121.60	$142.00	$217.50
300 Electric Kw. Hrs.	6,225	12,450	24,900	39,840	49,800	74,700
Cost	$91.05	$163.37	$272.90	$436.64	$545.80	$776.70
Gas M c.f.	75	150	300	480	600	900
Cost	$33.75	$65.00	$114.00	$182.40	$217.50	$295.00
400 Electric Kw. Hrs.	8,300	16,600	33,200	53,120	66,400	99,600
Cost	$107.65	$194.50	$322.70	$516.32	$645.40	$926.10
Gas M c.f.	100	200	400	640	800	1,200
Cost	$45.00	$85.00	$142.00	$228.50	$270.00	$370.00
500 Electric Kw. Hrs.	10,375	20,750	41,500	66,400	83,000	124,500
Cost	$124.25	$225.62	$327.50	$596.00	$745.00	$1,075.50
Gas M c.f.	125	250	500	800	1,000	1,500
Cost	$54.00	$105.00	$190.00	$270.00	$320.00	$443.00
600 Electric Kw. Hrs.	12,450	24,900	49,800	79,680	99,600	149,400
Cost	$140.85	$256.75	$422.30	$675.68	$844.60	$1,225.90
Gas M c.f.	150	300	600	960	1,200	1,800
Cost	$65.00	$125.00	$217.50	$310.00	$370.00	$512.00
700 Electric Kw. Hrs.	14,525	29,050	58,100	92,960	116,200	174,300
Cost	$157.45	$287.87	$472.10	$755.36	$944.20	$1,374.30
Gas M c.f.	175	350	700	1,120	1,400	2,100
Cost	0150.45	$287.87	$472.10	$755.36	$944.20	$1,374.30

and represents off-peak business, since heavy demand comes during summer months.

The better classes of industrial prospects are the following:

Paper Mills: Practically continuous week-day operation; 70 to 80 per cent load factor. Direct gas engine drive is usually most suitable, that is, applying gas engine power to the machines instead of generating electrical energy as an intermediate step. The horsepower requirements are large, since to connect machines individually or in groups as the occasion demands; direct gas engine drive thus cuts operating costs to a minimum by saving generating and motor losses. Speed variation is essential, giving the gas engine an advantage. Two large southern California paper companies have increased capacity of their paper machines more than 10 per cent by utilizing waste heats of the exhaust, by blowing it onto the paper while in the process of making. Waste heat from cooling water also should not be overlooked.

Flour Mills: 60 per cent to 80 per cent annual load factor; also operate from single gas engine drive.

Ice and Refrigeration Plants: 60 to 80 per cent annual load factor, maximum requirement coming in the summer; 60-70 per cent of load represents ammonia compressor drive and the balance auxiliaries.

Glass Manufacturing: Load factor usually in excess of 70 per cent.

Laundries, Office Buildings, Hotels, etc.: Poor load factor (20 to 35 per cent), but the consequently high average electric rate enables gas engines to make a good showing.

Municipal Business: Consists principally of domestic water pumping with load factor usually better than 50 per cent. Gas engines for such users may often be used for other power requirements when not in pumping service.

Every engine prospect situation calls for separate analysis, but such data as given in Table No. 1 and Table No. 2 will be found useful for preliminary estimates. Table No. 1 shows the approximate value of a power user as a prospect, since it gives comparative costs of operation with electricity and gas.

TABLE NO. 2. APPROXIMATE GAS ENGINE PRICES (INSTALLED).

H.P. Engine	Low Price	Medium Price	High Price	Rebuilt Engines
15	$ 300	$ 450	$ 500	$ 250
25	600	900	1,000	500
40	1,000	1,500	1,750	900
50	1,200	1,800	2,000	1,000
60	1,500	2,250	2,500	1,200
80	2,000	2,800	3,400	1,500
100	2,750	3,500	4,000	2,000
120	.....	4,000	4,800	1,250
160	.....	5,000	6,000	3,000
200	.....	6,500	7,500	3,500
250	.....	8,500	9,500	4,500
300	.....	.....	11,000	5,000

Table No. 2 give approximate first costs of several types of gas engine installations—low-, medium-, and high-priced, and second-hand or rebuilt. The latter frequently will answer the purpose where it is out of the question to install a new engine.

Natural Gas Report to Federal Trade Commission

A RECENT release from the Federal Trade Commission summarizes general aspects of the Commission's investigation covering production, distribution, and movement in interstate commerce of natural gas.

The release draws attention to the fact that natural gas now supplies five or six times the energy of the entire electric power and light industry, and that due to rapid development of pipe lines natural gas is either in or virtually at the gateway of every metropolitan area east of the Rockies, except in New England.

Examiner Harry Carter, member of the Commission's economic staff, prepared the report on natural gas for the Commission, from which the recent release gave a number of highlights.

Producing gas wells in the United States were estimated at 55,756, and pipe lines carrying natural gas at 50,000 miles as of the end of 1932. Customer increase between 1921 and 1931 amounted to 111 per cent. Natural gas use for generation of electric energy has increased 160 per cent in the 11-year period ending with 1930.

The report goes on to analyze the company structures controlling pipe line operations, stating that the four groups, Columbia Gas and Electric Corp., Standard Oil Co. (New Jersey), Cities Service Co., and Electric Power & Light Corp., control above 54 per cent of the total mileage.

Some 41 holding company groups were analyzed by states, eight of the groups producing 84 per cent of the total gas produced by all companies, and purchasing more than 85 per cent of the total purchased by all companies. In addition to the four companies named above, this group of eight includes Standard Gas and Electric Co., Lone Star Gas Corp., Tri-Utilities Corp., and National Fuel Gas Co. From an analysis of natural gas sales by 45 public utility companies the report states that four-fifths of the gas sold was accounted for by the eight companies mentioned above.

The release continues with an analysis of interstate movement of natural gas.

P. G. and E. Takes Advantage of Federal Housing Activities

Pacific Gas and Electric Co.'s commercial department has recently issued a communication to division managers, sales managers, and salesmen, calling attention to the Federal Housing Administration's program for building improvement, and urging that all advantage be taken of the financing available for gas and electric appliances. In September P. G. and E. released a full schedule of gas heat advertising as a forerunner to a united industry campaign on gas heat, soon to open.

Peoples Gas Light Employees Make Good Heating Prospect Showing

Employee prospect work for space heating customers has been very active in past weeks in the Peoples Gas Light & Coke Co. During a little more than a 3-weeks period in August a total of 3900 prospects were received from company employees, of which 2466 were classed as space heating prospects, and from this number 363 space heating sales were reported, each sale bringing $5 from the company to the employee turning in the prospect's name.

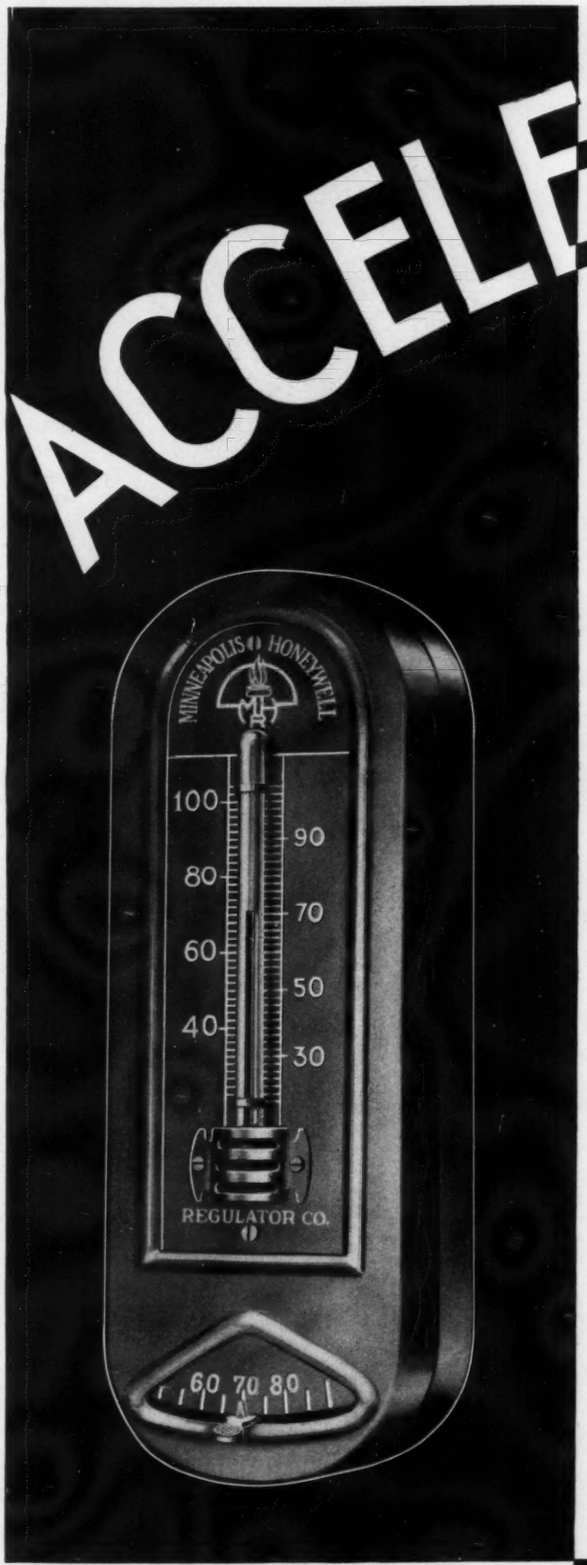
ACCELERATION

Enables this New Thermostat to Produce Efficient Gas Heat

■

ACCELERATION — not anticipation — enables this newest Minneapolis-Honeywell thermostat to provide more accurate and efficient control for gas burners. It operates as a conventional thermostat only until the downward trend of temperature has been stopped and the temperature level at which the burner started has been reached. Its action is then electrically **accelerated** by means of a small heating coil to maintain even temperature and prevent overheating. The proved Series 10 principle, exclusive with Minneapolis-Honeywell, makes this new thermostat possible. Equip your burners with the new heat **accelerated** thermostat and enable users to derive the fullest satisfaction from gas heat. Control is maintained from the common sense breathing level. Minneapolis-Honeywell Regulator Co., 401 East 28th St., Minneapolis, Minn. Branch and distributing offices in all principal cities.

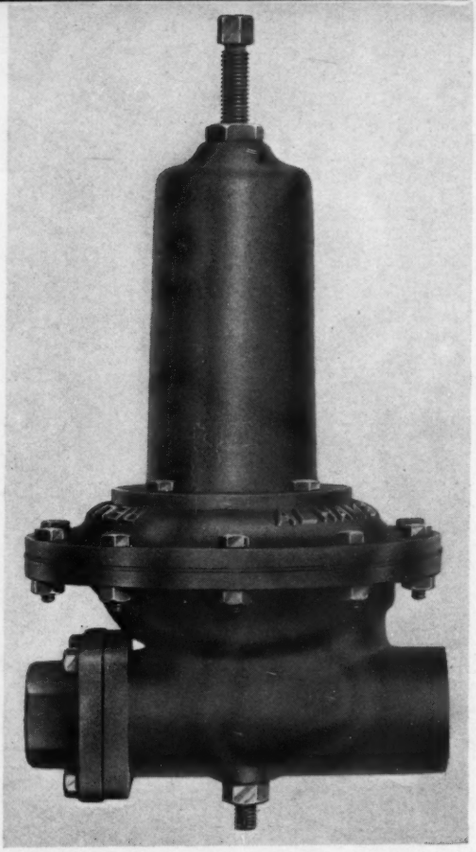
■



The new Minneapolis-Honeywell T-17 Heat Accelerated Thermostat. **Electrically accelerated** to maintain even temperature and prevent wasteful overheating.

MINNEAPOLIS HONEYWELL
Control Systems

RELIANCE REGULATORS



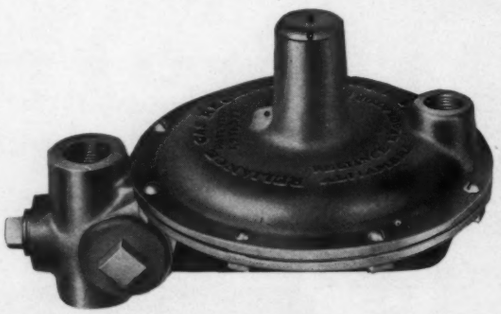
Above. Reliance High Pressure Compounding Regulator. Fully Patented.

. . . Maintain Uniform Pressures

Reliance Regulators maintain uniform delivery pressures at extremely high rates of flow and have an exceedingly low lock up. Type H and Type K Regulators are made in spring loaded or dead weight types, with or without a mercury seal. Valve and valve seats are easily accessible for inspection and replacement through the hand hole, and adjustments for changing pressure are readily made.

The High Pressure Compounding Type Regulators in ¾", 1" and 2" sizes, are for reducing extremely high inlet pressures to intermediate pressures of between 5 and 40 lbs. They are extremely compact with high capacities and have a positive lock up.

The Reliance Organization also manufactures a complete line of industrial, domestic and district regulators. These include Type A, weight loaded appliance regulators either with or without safety factor, and Type Y, spring loaded appliance regulators.



Above. Type H or K Spring Loaded Regulator. Manufactured also in dead weight type. Patent No. 1,931,777.

RELIANCE REGULATOR CORPORATION

1000 Meridian Ave. Alhambra, California

REGULATORS FOR MANUFACTURED, NATURAL AND BUTANE AIR GASES

Summary of Recent Progress in Measurement of Fluids by Orifice Meter

By WILLIAM L. COWAN

*Union Oil Company of California**

THE first installment of Mr. Cowan's paper appeared in *Western Gas* for September, and covered a number of recent studies concerning fluid measurement by orifice meter. In this concluding installment the author co-ordinates the results of these studies and applies them to commercial measurement procedure, developing a number of practical formulae by which Reynolds Numbers may be easily checked for flow of any liquid and any gas. Several problems have been presented as examples showing the range of variation in coefficients which may be encountered in practical measurement work.—*Editor.*

IV. Calculation of Flow of Liquids Through Orifice Meters With the Aid of the Reynolds Number

The general orifice meter formula for liquids is

$$Q = 340.0 \times C \times F \times d^2 \sqrt{h \times T_c/G}$$

= Gal. per hr. at 60° F.

Where C = Orifice meter coefficient of discharge, not including the velocity of approach

$F = 1/\sqrt{1-(d/D)^4}$ = Velocity of approach factor

d = Diameter of orifice in inches

D = Internal diameter of pipe in inches

h = Net inches of water differential pressure at 60°F. corrected for meter factor

T_c = Volumetric temperature correction to reduce volume of flowing liquid at T°F. to its equivalent volume at 60°F.

G = Specific gravity of flowing liquid at 60°F. (water at 60°F. = 1.0)

M = Meter factor for converting the indicated differential (h) to the true differential pressure in inches of water. For example in a mercury type meter where meter is held at 60°F. and the same liquid as that flowing through the line is in contact with the mercury, M = 1 − G/13.58 and where G = 1.0 for water, M = 0.927

h^1 = Indicated differential pressure in inches of water at 60°F. and

$h = Mh^1$

The coefficient (C) has been shown to be a function of the Reynolds Number for the condition of flow and meter dimensions existing. By knowing the Reynolds Number, (C) can be found from Beitler's Data. (See Fig. 4.)

Calculation of Reynolds Number for Liquids

$R = Vd^1m/u$ = Reynolds Number

Where

V = Velocity of fluid at downstream face of orifice in feet per second

d^1 = Diameter of orifice in feet = (d/12) where d = diameter in inches

m = Density of liquid at downstream face of orifice in lbs. per cubic foot

u = Absolute viscosity of liquid in lbs. per second foot at flowing conditions.

$V = C F \sqrt{2gH}$

Where

C is estimated coefficient of discharge

g = 32.16

H = Feet head of flowing liquid = h/12 GT_c

m = Practically a constant for any true liquid at a given temperature

= G × T_c × 62.37, where 62.37 = Weight of 1 cu. ft. water at 60°F.

$$R = \frac{C F \sqrt{2gh/12\,GT_c} \times (d/12) \times GT_c \times 62.37}{u}$$

$= 12.04\ CFd\sqrt{hGT_c}/u$ = Reynolds Number for any liquid

For water at 60°F., G = 1.0; T_c = 1.0; u = .000672. For vena contracta taps C can be assumed as being equal to 0.600 without a great deal of error in the final corrected value of C, and

$R_{\text{water at 60 deg.}} = 12.04 \times .6 \times F \times d\sqrt{h} / .000672 = 10750 \times F \times d\sqrt{h}$

Illustrative examples of variation of C with R for water at 60 deg. F. using vena contracta taps are given in Table No. 3.

Calculation of the Reynolds Number for liquids in any circular tube or orifice when the flow rate is known may be done as follows:

Let Q = flow rate gals. per hr. at 60° F.

Then $R = .03538 \times QGT_c/du$

V. Calculation of Flow of Gases Through Orifice Meters With the Aid of Coefficients Based on Reynolds Numbers

The general orifice meter formula for gases is

$Q = 338.2\ C F d^2 \sqrt{hPY \times 520/G \times T}$ cu. ft per hr. at 14.73 lbs. and 60° F.

Where CF corresponds to ordinary coefficient

C = Discharge coefficient without velocity of approach factor.

$F = 1/\sqrt{1-(d/D)^4}$ = Velocity of approach factor

d = Diameter of orifice in inches.

D = Internal diameter of pipe in inches.

h = Differential pressure in inches of water at 60° F.

P = Absolute static pressure. The value of P used in computations by different authorities varies considerably. Beitler uses P as the average of the upstream and downstream pressure, while the Bureau of Standards uses the upstream pressure corrected by an expansion factor. Others use the downstream pressure with other corrections. (Lbs. per sq. in. abs.).

Y = Super compressibility correction (commonly called Boyles Law Deviation Correction) for high pressures.

G = Specific gravity of the gas at atmospheric conditions (air = 1.0).

T = Temperature of flowing gas at orifice (°F abs.).

The orifice discharge coefficient (C) is assumed to be the same for all fluids having the same Reynolds Number and the same orifice diameter ratio.

*Presented before the Southern California Meter Association, June 28, 1934.

TABLE NO. 3. ILLUSTRATIVE EXAMPLES OF VARIATION OF C WITH R FOR WATER AT 60° F., USING VENA CONTRACTA TAPS

Example	C (est)	d	D	d/D	F	h	R	Corrected C	Pct. Varia. (a) to (d)
1—a	.600	1.500	13.250	.1132	1.0001	5	36,000	.6015	1.0
—b						10	51,000	.5994	
—c						50	114,000	.5963	
—d						100	161,000	.5963	
—e						900	483,000	.5923	
2—a	.618	1.500	2.067	.726	1.177	5	44,000	.6235	1.7
—b						10	62,000	.6205	
—c						50	138,000	.6160	
—d						100	196,000	.6135	
—e						900	586,000	.6095	
3—a	.600	9.500	13.250	.717	1.165	4	238,000	.613	*0.8
—b						49	831,000	.609	
—c						100	1,188,000	.608	
4—a	.600	2.89	4.026	.717	1.165	4	72,300	.619	*1.3
—b						49	253,000	.612	
—c						100	362,000	.611	
5—a	.600	0.456	4.026	.1132	1.0001	4	9,800	.612	*2.0
—b						49	34,300	.602	
—c						100	49,000	.600	

Variation in C between examples (1d) and (5c) = 0.7%
Variation in C between examples (1d) and (5a) = 2.6%
Variation in C between examples (3c) and (4c) = 0.5%
Variation in C between examples (3c) and (4a) = 1.8%

* (a) to (c)

Computation of Reynolds Number for Any Gas

$$R = V\, d^1\, m / u$$

Where

V = Velocity of gas at outlet plane of orifice in feet per second.

d^1 = Orifice diameter in feet = d/12 where (d) is in inches.

m = Density of gas at downstream plane of orifice in lbs. per cu. ft.

u = Viscosity of gas at flow conditions in lbs. per second foot.

$$V = CF\sqrt{2gH}$$

Where

g = 32.16 (feet per second)^2

H = Differential pressure in feet head of flowing liquid.

h = Differential pressure in inches head of water at 60° F.

and

H = h × 62.37/12m where 1 cu. ft. water = 62.37 lbs. per cu. ft.

Therefore

$$V = C\,F\sqrt{2\,g\,h \times 62.37 / 12 \times m}$$

$$= 18.29\ C\,F\sqrt{h/m}\ \text{ft. per sec.}$$

$$R = 18.29\ C\,F\sqrt{h/m} \times (d/12) \times m/u$$

$$= 1.523\ C\,F\,d\sqrt{h\,m}/u$$

To calculate (m) at line conditions for any gas, the simplest method is to express it in terms of atmospheric air.

For air at atmospheric pressure and 60° F.

144 × P × v = w R_c × T, where P = Pressure in lbs. per sq. in. absolute.

v = Volume of 1 lb. air at pressure P and temperature T.

w = Weight of air = 1 lb.

T = Absolute temperature air in ° F.

R_c = Air constant = 53.3 at atmospheric conditions.

$$m_{air} = 1/v = 144 \times P/1 \times 53.3 \times T$$

(Not correcting for supercompressibility of air.)

For any gas of specific gravity G (at atmospheric conditions) having a supercompressibility factor of (Y), the density at any pressure and temperature

$$m_{gas} = 144 \times P \times G \times Y / 1.00 \times 53.3 \times T$$
$$= 2.70 \times P \times G \times Y / T$$

$$R = 2.503 \times C \times F \times d\sqrt{h \times P \times G \times Y/T}$$

/ u = General equation for any gas, any type taps.

For air at 60° F., u = .00001209, C (estimated) = 0.60; Y = 1.0; G = 1.00

$$R = (5450 \times F\,d\sqrt{h\,P})$$

Calculation of the Reynolds Number for any flow of gases in any circular tube or orifice when the flow rate is known, may be done as follows:

Let Q = flow rate standard cu. ft. per hr. (P_s = 14.73 and T_s = 520)

Then R = .0003248 QG/du.

VI. ILLUSTRATIVE EXAMPLES SHOWING CALCULATIONS OF (R) AND DETERMINATION OF DISCHARGE COEFFICIENT (C) FOR NATURAL GAS AND FOR AIR AT VARIOUS CONDITIONS OF FLOW BY MEANS OF BEITLER'S DATA FOR VENA CONTRACTA TAPS.

(A) *Natural Gas* (Methane 81%, Ethane 19%) at 60°F; G = .644; u = .0000069; C (estimated) = 0.60; and (Y) neglected.

Formula $R = 7670.\,F\,d\sqrt{h\,P}$ where $P = (P_1 + P_2)/2$

See Table No. 4 for examples.

(B) *Air* at 60° F.; u = .00001209; (Y) Neglected; C (estimated) = 0.6.

$$R = 5450.\,F\,d\sqrt{h\,P}$$

See Table No. 5 for examples.

Indications from the comparisons in Tables No. 4 and No. 5 of (C) for air with that of (C) for gas at the same pressure, temperature and differential pressures passing through the same orifice meter, are that the coefficient for air will always be slightly larger than that for common natural gas, the greatest variation occurring in the range of pressures at and below atmospheric pressure and particularly low differentials.

VII. COMPARISON OF U. S. BUREAU OF STANDARDS THROAT TAP COEFFICIENTS AND METHODS OF COMPUTATION OF GAS VOLUMES AND THOSE USED BY BEITLER FOR VENA CONTRACTA TAPS

Problem 1.

Assume the following:

G = .644
T = 60° F. = 520° F. Abs.
u = .0000069 lbs. per sec. ft.
Z = (Cp/Cv) = 1.283
P_1 = 14.73 lbs. per sq. in. abs.
h = 50 inches water
D = 15.38
d = 7.69
(d/D) = 0.500
F = 1.032
Y = 1.000

(a) Bureau of Standards Method Converted to Commercial Method of Figuring:

$$Q = 338.2 \times C^1\, d^2\, T_f G_f \sqrt{h\,P_1} = \text{Std. cu. ft. per hr. at 14.73 lbs. per sq. in. and 60° F.}$$

Where

T_f = Temperature Factor = 1.0

G_f = Gravity factor = 1.246

C^1 = Discharge coefficient corrected for expansion and including (F) = WK and K = FC

The Bureau of Standards throat tap curve (See Fig. 4) for C = (K/F) is plotted on

Reynolds Number curve sheet for this size line as = .610. Therefore K = 1.032 × .610 = .6295.

The expansion factor = W is then computed:

$$W = 1 - [0.41 + 0.35\ (d/D)^4]\ (1-y)/Z$$

$$y = [14.73 - 50/27.68]/14.73 = .877$$

$$W = 1 - (0.41 + 0.35 \times 0.5^4) \times 1.23/1.283 = .9586$$

$$C^1 = KW = .6295 \times .9586 = .603$$

$$Q = 338.2 \times .603 \times 7.69^2 \times 1.000 \times 1.246 \sqrt{50 \times 14.73} = 407.5 \text{ Std. M c.f. per hour.}$$

(b) Beitler's Method Converted to Commercial Method of Figuring:

$$Q = 338.2 \times C\ d^2\ F \times T_f \times G_f \sqrt{h P}$$ Std. M c.f. per Hour

$T_f = 1.0$; $G_f = 1.246$; $F = 1.032$

P = Average pressure = $(P_1 + P_2)/2$

= 13.825 lbs. per sq. in.

$$R = 2.503 \times .6 \times 1.032 \times 7.69 \times \sqrt{50 \times 13.825 \times .644/520/.0000069} = 1600000$$

C (from Fig. 4 curve) = 0.6025 vena contracta taps

$$Q = 338.2 \times .6025 \times 1.032 \times 7.69^2 \times 1.000 \times 1.246 \sqrt{50 \times 13.825} = 407.5 \text{ Std. M c.f. per Hour}$$

Problem 2.

Assume all conditions the same as those for Problem No. 1 with the exception that h is changed from 50 inches to 8 inches.

Q by Bureau of Standards = 168.9 Std. M c.f. per hr.

Q by Beitler = 167.7 Std. M c.f. per hr. (R = 658,000)

Difference = 0.7%

Problem 3.

Assume G = .644; T = 60°F.; u = 0000069; Z = 1.283; d = 2.000; D = 8.071; (d/D) = .248; F = 1.002.

(a) For P = 14.73 and h = 50

Q by (Bureau of Standards) = 26.40 Std. M c.f. per hr.

Q by (Beitler) = 26.40 Std. M c.f. per hr. (R = 404,000)

Difference = 0.0%

(b) For P = 14.73 and h = 8 inches

Q by (Bureau of Standards) = 10.98 Std. M c.f. per hr.

Q by (Beitler) = 10.97 Std. M c.f. per hr. (R = 166,000)

Difference = 0.0%

TABLE NO. 4.

Example	d	D	d/D	F	h	P	R	C	Variation in C
1—a	1.500	13.250	.1132	1.0001	4	14.73	88,000	.597	
—b					49	14.73	300,000	.593	0.75%
—c					100	14.73	413,000	.5925	
—d					50	7	201,000	.594	
—e					50	100	809,000	.592	0.58%
—f					50	500	1,820,000	.5905	
2—a	0.456	4.026	.1132	1.0001	4	14.73	26,600	.603	
—b					49	14.73	91,000	.597	1.17%
—c					100	14.73	126,000	.596	
—d					50	7	66,000	.5985	
—e					50	100	246,000	.5937	1.08%
—f					50	500	551,000	.592	
3—a	9.500	13.250	.717	1.165	4	14.73	651,000	.6095	
—b					49	14.73	2,220,000	.607	0.58%
—c					100	14.73	3,050,000	.606	
—d					50	7	1,480,000	.608	
—e					50	100	5,970,000	.6055	0.50%
—f					50	500	13,400,000	.605	
4—a	2.89	4.026	.717	1.165	4	14.73	199,000	.613	
—b					49	14.73	675,000	.609	0.75%
—c					100	14.73	920,000	.6085	
—d					50	7	450,000	.610	
—e					50	100	1,820,000	.607	0.67%
—f					50	500	4,060,000	.606	

Variation in Coefficient of Discharge C for 4.026 and 13.25 Inch Lines

		d/D = .1132			d/D = .717		
h	P_1	4.026	13.250	% Diff.	4.026	13.250	% Diff.
4	14.73	.603	.597	1.17	.613	.6095	0.58
100	14.73	.596	.5925	.58	.6085	.606	0.42
50	7.	.5985	.594	.75	.610	.608	0.33
50	500.	.592	.5905	.25	.606	.605	0.17
Maximum variation at constant temperature				2.1			1.35

TABLE NO. 5.

Example	d	D	d/D	F	h	P.	R	C_{air}	C_{gas}	% Varia.
1	1.500	14.000	.1071	1.0001	50	14.73	215,000	.5943		
2	1.500	2.000	.750	1.210	50	14.73	260,000	.6122		
3-a	1.500	13.250	.1132	1.0001	4	14.73	62,300	.5983	.597	0.22
3-b	1.500	13.250	.1132	1.0001	50	500.	1,290,000	.5910	.5905	0.08
4	0.456	4.026	.1132	1.0001	4	14.73	19,000	.606	.603	0.50

VIII. General Conclusions

(1) Specifications for orifice plate thickness (Reference Fig. 1):

(a) Thickness of orifice edge (t) U. S. Bureau of Standards 0.03 D > t > 0.01D

(b) Thickness of orifice edge (t) Beitler d > 8t and (D—d) > 8t

By U. S. Bureau of Standards Recommendations (No Specifications for t with reference to d)

if t = ¼ inch allowable D would lie between 8.34 to 25.0 inches

t = ⅛ inch allowable D would lie between 4.17 to 12.5 inches

t = 1/16 inch allowable D would lie between 2.08 to 6.25 inches

t = 1/32 inch allowable D would lie between 1.04 to 3.18 inches

By Beitler's Method where (d > 8t):

t = ⅛ inch allowable for all orifices of d = 1 inch or over

= 1/16 inch allowable for all orifices of d = ½ inch or over

= 1/32 inch allowable for all orifices of d = ¼ inch or over

$D_{minimum}$ for (d/D) = 0.2	t
5.00″	⅛″
2.50″	1/16″
1.25″	1/32″

By Beitler's Method where (D—d) > 8t (See Table No. 6):

t = ⅛ inch (D—d) = 1.0 inch maximum allowable

t = 1/16 inch (D—d) = ½ inch maximum allowable

t = 1/32 inch (D—d) = ¼ inch maximum allowable

TABLE NO. 6.

Lower Limit				Pipe sizes where t ceases to have any effect
t (inches)	d max. (inches)	D (inches)	(d/D)	Minimum pipe diameter D (inches)
⅛	1	2	0.50	Any pipe (d/D) < 0.75 if D = or > 4
⅛	½	1	0.50	Any pipe (d/D) < 0.75 if D = or > 2
⅛	(¼-¾)	1	(0.25-0.75)	Any pipe (d/D) < 0.75 if D = or > 1

See Table No. 6 for summary of Beitler's specifications for orifice thickness.

It appears that Beitler's data nearly check the Bureau of Standards as to point where edge thickness has no possible effect on any orifice in the limits specified. However, Beitler's data indicates greater edge thicknesses are allowable in certain instances than Bureau of Standards, but they are not recommended. Beitler also does not state an upper limit of pipe size for edge thickness, other than its effect upon (D—d).

(2) Beitler has definitely shown that for standard orifices in pipes the coefficient of discharge varies with the Reynolds Number regardless of the type of fluid passing (at least for Reynolds Numbers greater than 10,000), for any given diameter ratio orifice.

(3) The assumption by U. S. Bureau of Standards that for flow condition where R is greater than 200,000 the coefficient of discharge will be constant, has been disproved by Beitler as shown in Fig. 4. For vena contracta taps within limits of (d/D) between 0.2 and 0.75 there is a maximum variation in the coefficient of 1.3 per cent between R = 200,000 and 10,000,000. Many ordinary metering problems occur where R is much less than 200,000, which can be solved accurately with the aid of Beitler's data.

(4) High Reynolds Numbers signify a lower coefficient of discharge than for low Reynolds Numbers for a given (d/D) ratio.

(5) Ordinary gas flows usually give lower coefficients of discharge than liquids for a given (d/D) ratio and differential pressure if orifice diameter is the same, due to higher Reynolds Numbers for gases compared to liquids.

(6) Similarly discharge coefficients for gas are usually lower than for air under same differential, pressure, orifice diameter and (d/D) ratio.

(7) Reynolds Numbers increase with pressure of a gas.

(8) For the same gas at same temperature, pressure and differential and same (d/D) ratio, the discharge coefficients for a small size line will always be higher than for a larger line. However, by changing flow rates this condition may be reversed.

(9) The use of *average* pressure in computation of gas flows by Beitler's method may or may not be absolutely correct, but it appears that by its use a high degree of accuracy is obtainable, and does away with calculation of the expansion factor.

(10) The Bureau of Standards method of assuming that liquids flowing through orifices having a Reynolds Number of 200,000 or greater have a constant coefficient of discharge, and the application of an expansion factor for gases to this so-called fixed coefficient appears to offer a simpler method than that of the Reynolds Number. Whether its accuracy is as great, is doubtful.

(11) It has been suspected for some time that the coefficients now generally used commercially, need revising. The methods of computing gas flow now in general use are extremely simple, but their limitations to various types and ranges of flow conditions do not allow for the increased accuracy required in commercial measurement at this time.

(12) It seems probable that the Reynolds Number method of computing coefficients and flow of fluids could be simplified by means of special tables or curves, allowing definite tolerances in the allowable accuracy of the coefficient of discharge.

(13) It is possible that the use of the Bureau of Standards method of calculating gas flows will be more applicable to commercial methods of figuring if flow rates are limited to high Reynolds Numbers. However, it appears that the basic method is that worked out by Beitler, that is, the Reynolds Number method.

(14) It appears likely that the allowable maximum diameter ratio for pipe taps will need reduction.

(15) By the above detailed discussion of variations in the coefficient of discharge for orifices, it is hoped to acquaint the reader with the various methods and data now available, so that when the complete data are published by Prof. Beitler for flange, corner and throat taps, etc., a comparison between flows as computed by present methods to those by the more accurate methods can be easily made. Such a comparison, although possibly not resulting in a complete change in the present method, will show exactly within what limitations the present coefficients can be used to produce results within certain tolerances, and what types of pressure taps will be preferrable.

(16) Likewise, data which may be published on coefficients published by U. S. Bureau of Standards may be better compared both to Beitler's data and that now used commercially.

Full Schedule of Meter Association Activities

FOLLOWING unexpected postponement of its scheduled September 27th meeting, Southern California Meter Association is preparing an unusually good program for October 25, the date of its next regular meeting. The dinner session will be held at the Lakewood Golf Club, Long Beach, Calif.. and entertainment features are scheduled in addition to the speaking program.

Two days following its October 25 meeting, on October 27, will come the Association's third Jubilee Golf Tournament, featuring the playoff among the 12 contenders for the *Western Gas*-S.C.M.A. Goodfellowship Trophy, and also a general tournament for all Association members, with many prizes at stake. This event will take place at Rio Hondo Country Club, arrangements being in charge of the Association's entertainment committee made up of Frank Colton, Associated Oil Co. chairman; J. J. Delaney, Reliance Regulator Corp., George Christian, American Meter Co., D. M. Hill, Foxboro Co., and J. A. Smith, Texas Co.

Prizes are being donated by equipment company members of the Association, and the list includes separate awards for several events—low gross, low net, low gross on three-par holes, low gross on five-par, longest drive from No. 1 tee. There will also be a flag tournament and other special prizes, including a blind bogey.

One of the most important S.C.M.A. meetings of the year, the Annual Exhibitors' Night, has been arranged for November 22 in the auditorium of the Los Angeles Gas and Electric Corp. building. It is planned to hold a dinner in the same building, in connection with the meeting.

Industrial Gas Exhibit at National Metal Exposition

An industrial gas equipment exhibit will be included in the National Metal Exposition to take place in the Port Authority Commerce Building, New York City, October 1-5. Eighteen manufacturers of industrial gas equipment will display products.

The National Metal Exposition exhibits all types of equipment used in the metal trades, and is conducted under the auspices of the American Society for Metals, American Welding Society, the Institute of Metals division and the Iron and Steel division of the American Institute of Metallurgical Engineers, and the Wire Association.

Paramount Mfg. Co. Distributing Daniel Orifice Fittings

Paramount Manufacturing Co., San Francisco, has been made sales distributor for the Daniel Orifice Fittings Co.'s line of products in California, Oregon and Washington. J. O. Wiley will represent Paramount Manufacturing Co. in southern California, and S. R. Dows in the northern section.

BUTANE-PROPANE NEWS

Kitchen on Wheels for Skelgas Promotion

By W. G. WATKINS

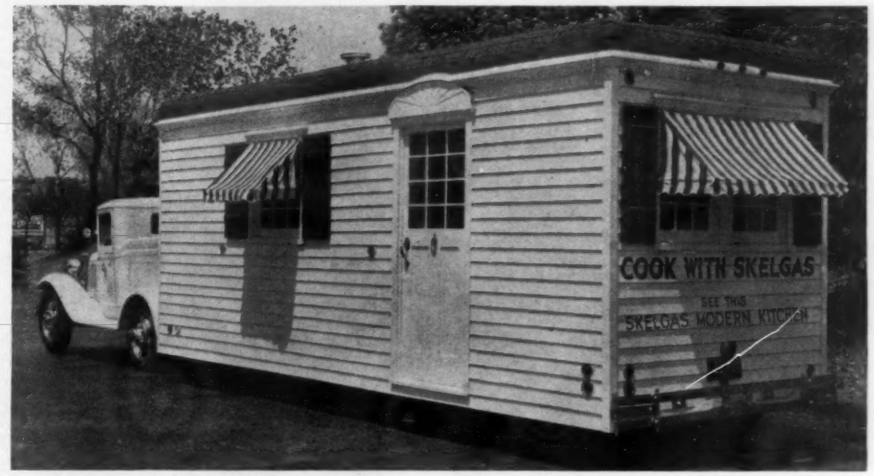
Skelgas Company
Kansas City, Missouri

THE field of merchandising liquefied petroleum gas for domestic use has been a testing ground for many sales policies and many advertising plans, most of which are adaptations from other fields.

General ground work for the effort to make rural communities "Gas Minded" has been laid by radio and newspaper advertising, broadside mailings, etc., presented by the major companies. Special sales efforts to suit the particular operations for each company are constantly necessary if new sales are to be obtained, as at this time in particular, substantial family investment in household equipment is not being made without thorough investigation.

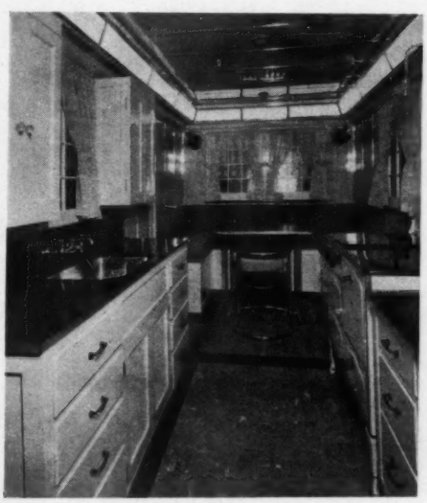
The idea of carrying your wares to the consumer instead of waiting for the consumer to come in to see your wares is not new in selling nor is it new in liquefield petroleum gas marketing. In fact, it has been tried by some and condemned, and tried by others and recommended, but no one has put into such a program the effort and investment necessary to really prove the merits of such a program on fair trial basis.

Skelgas Co. has constructed as elaborate and complete a model kitchen as is practicable, not with the intention of building a show wagon in which to display a few ranges, but with the purpose of creating a natural "drawing appeal," based on the knowledge that the average woman is strongly attracted by home beautification and household convenience. Such a display unquestionably creates in the prospect the desire for something better, something new—the secret to the ultimate sale. These appeals the designers have endeavored to incorporate in the "Skelgas Care Free Kitchen."



ABOVE: Attractive exterior of the Skelgas Model Kitchen.

Another view of the kitchen interior; note Skelgas unit in background.



Modern appointments in the Skelgas touring kitchen.

Beauty, an essential factor in creating desire, has been incorporated at every opportunity, though in certain features, serviceability of course demanded primary consideration. Also, certain advertising was considered necessary, such as the signs on the exterior and the Skelgas installation on the interior, which factors were handled in a modest way.

The kitchen appointments include a gas range, gas light, water heater, refrigerator, kitchen sink, cupboards, etc., all designed and finished to match. Arrangement of these appointments and the auxiliary equipment, such as the public address system, serving table, 100-gallon water storage system, ventilation system, lighting system, etc., was rather difficult, due to space limitations and the window and door openings required.

The kitchen is 7 feet wide by 7½ feet high by 20 feet long, over all, and has much greater eye-appeal than can be reflected in black and white pictures.

The arrangement of the appointments is aimed at maximum convenience; the refrigerator adjoins the serving table which in turn adjoins the range. Opposite the range and work table is the kitchen sink.

The Skelgas Model Kitchen is a working exhibit, all appliances being connected with the gas supply.

Operation of the "Kitchen" has been given careful consideration. It is conducted from the home office, from which advance schedules and publicity are arranged. The personnel includes a man thoroughly familiar with the installation and operation of Skelgas and a woman home economist. The prospect meets the best Skelgas Co. can offer, from equipment to personnel.

On its trial excursion the "Skelgas Model Kitchen" has met with a more eager reception than anticipated and at each stop the time available invariably is found to be "too short," despite the fact that they are all-day stops.

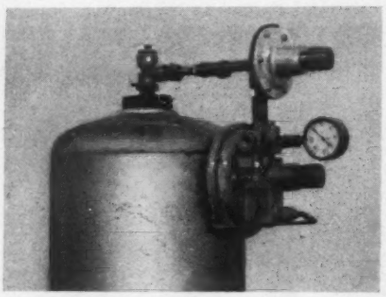
New Dealer Sales Plan Adopted

Rulane Gas Co., bottled gas distributors with headquarters at Cherryville, N. C., have inaugurated a new program of dealer expansion, whereby dealers will secure customers' leases for Rulane Gas Co. and receive a percentage of the retail price of the fuel, instead of purchasing fuel from the parent organization for resale.

Announcing

"GASAIR"

Emergency-Repair Unit



Furnishing a Propane-Air mixture that makes burner adjustments unnecessary in change-over or emergency stand-by for either natural or manufactured gas service.

Operates on all makes of Bottled Gas.

Eliminates running a by-pass when work on service line is necessary.

The cost of a unit is less than the cost of running a by-pass.

UTILITY DEVELOPMENT COMPANY

5815 Third Street San Francisco, Calif.

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tested and proved

FORGED BRASS VALVES, MANIFOLDS *and* FITTINGS

for

PROPANE BOTTLED GAS SERVICE

Write for descriptive circular

KEROTEST MFG. CO.

PITTSBURGH, PA.

KEROTEST

California Natural Gas Utilities in Merger

The California Railroad Commission on September 10 authorized merger of the West Side Natural Gas Co. and the Natural Gas Corp. of Calif., both headquartering in Santa Cruz., Calif. The merger of the two companies will result in a unified stock structure, simplified accounting, and will reduce taxes and operating costs.

The agreement calls for the absorption of the West Side Natural Gas Co., owned by the Pacific Public Service Co., San Francisco, into the Natural Gas Corp. of Calif., owned by the Natural Gas Properties, Inc., which is also a subsidiary of Pacific Public Service.

West Side Natural Gas Co. serves natural gas in Taft, South Taft, Ford City, Maricopa, Fellows, Kettleman City and Avenal, Calif. Natural Gas Corp. of Calif. serves liquefied petroleum gas in Arcata, Brawley, Calexico, Dunsmuir, El Centro, Suisun, Fairfield, Isleton, Rio Vista, Vacaville and Yreka, Calif.

New Patent Grants Made In Liquefied Petroleum Gas Field

Recently granted patents in the liquefied petroleum gas industry reported in a recent issue of the Compressed Gas Monufacturer's Association News Bulletin, include U. S. 1,965,126 of July 3 to the Prest-O-Lite Co., New York, N. Y., on a process and apparatus for filling gas containers; U.S. 1,941,304 of December 26, 1933, to C. P. W. Heylandt for a means of preventing the overfilling of warm evaporators; U. S. 1,967,164 of July 17, 1934, to R. W. Thomas, Philgas Co., on apparatus for proportioning and mixing gases; U. S. 1,967,717 and U. S. 1,967,718 of July 24, 1934, to the Linde Air Products Co., New York, N. Y., on a process, and an apparatus, respectively, for purifying liquefied gases; U. S. 1,947,099 of February 13, 1934, to M. E. Painter on a liquid gas vaporizer; and U. S. 1,968,141 of July 31, 1934 to J. B. Green on a petroleum gas (liquid) distributing system.

Coquille Gas & Power Co. Names Officers

Officers for the newly organized Coquille (Ore.) Gas & Power Co. have been named as follows: President, R. A. Jeub; vice-president, Lafe Compton; secretary-treasurer, J. Arthur Berg.

The company is opening a showroom which will feature a complete line of gas appliances, and has appointed Jack Lebvre sales manager, according to Mr. Jeub.

Philgas Division Also Absorbed by Phillips Petroleum

Phillips Petroleum Co., through its recently created Liquefied Gas Department, has taken over all functions formerly exercised by Philgas Co., its subsidiary for the marketing of liquefied petroleum gases. Such an arrangement became effective June 1 so far as the tank-car business of the Wholesale, Industrial and Gas-Manufacturing Divisions of Philgas Co. were concerned. By the extension of the plan to include the Philgas Division, handling retail sales of bottled gas and the filling of cylinders for such wholesale accounts as do not make tank-car purchases, the absorption of Philgas Co. by the parent organization becomes complete.

The same personnel will be used throughout and the trade-name "Philgas" will continue to be applied to the propane product for domestic consumption.

News Bulletins Issued by National Bottled Gas Association

The National Bottled Gas Association, 110 W. 40th St., New York City, has issued the first of a series of news bulletins to be sent to member companies. The purpose of the bulletins, according to Mark Anton, president, is to supply information to member companies which will be of assistance in coordinating sales and operations methods and in combatting competitive fuels effectively. Such news items have formerly been included in the general bulletins of the Compressed Gas Manufacturers' Association.

Proposal to Make Code Expense Contributions Mandatory

A proposal to make mandatory on members of the liquefied gas industry contributions to the expenses of code administration has been filed with the National Recovery Administration by the Code Authority. The Code Authority under the proposed modification would be empowered to institute legal proceedings in its own name to enforce contributions called for under budgets approved by the Administrator.

Business Booming for Gas Service In September Sales Work

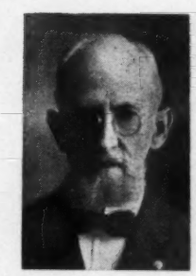
New business departments of Gas Service Co. properties, in a five-day gas range campaign held September 4-8 inclusive, sold a total of 435 ranges—the most successful short range drive in the company's history. Gas Service Co. expects the month of September to be the best from a sales standpoint in a number of years, anticipating gross sales of more than $100,000.

New Mexico Asks Federal Aid in Natural Gas Development

The State of New Mexico through Senator Bronson has requested the Public Works Administration to delegate an engineer to survey the power development possibilities in the natural gas fields in Lea and San Juan Counties of the state, to the end that such resources might be utilized in agricultural development rendering New Mexico immune from crop failure due to drought conditions.

Opens Valley Liquid Gas Co.

Eugene Boose, formerly superintendent of the Northern Division for the Southern California Gas Co. at Glendale, recently opened the Valley Liquid Gas Co. at Van Nuys, Calif., to engage in bottled gas distribution and sale of appliances for both bottled gas and natural gas use.



N. L. Morse

R. Y. Handasyde

N. L. Morse Retires from Active Service with Southern California Gas Co.

N. L. MORSE, supervisor of purchases for the Southern California Gas Co., Los Angeles, on September 1 retired from active duty after 21 years as purchasing executive for the company.

Mr. Morse has been a member of the Pacific Coast Gas Association for 17 years. He organized the Los Angeles Purchasing Agents Association and was elected its first president. He was a member of the first Board of National Directors of the National Association of Purchasing Agents.

R. Y. Handasyde, with the Southern California Gas Co. for the past two years, has been named to succeed Mr. Morse as supervisor of purchases for the company.

"Practical Everyday Chemistry" Covers Wide Product Field

"Practical Everyday Chemistry" is the title of a 300-page volume brought from the press by the Chemical Publishing Co., 1450 Broadway, New York, N. Y. Contents consist of formulas for making a great number of products, arranged into such groups as adhesives, coatings, cosmetics and drugs, emulsions, food products, lubricants, construction materials, photographic materials, polishes, etc. The book is designed to interest the layman as well as those having use for a ready reference in the fields covered, and it answers many questions as to composition of hundreds of products in common use.

"Practical Everyday Chemistry" may be obtained from the publishers at $2.00 per copy, in the U.S.A., or $2.25 foreign.

Fort Scott and Beloit Gas Offices Moved

Union Public Service Co., a Gas Service Co. subsidiary, announces removal of its Fort Scott and Beloit offices to new locations. A new office and warehouse will be occupied at 101 South Scott Street in Fort Scott, where arrangements have been made for attractive appliance display. The Beloit office will be moved into the James Building at 207 South Mill Street.

Southern Counties Gets Renewal Franchise in Santa Barbara

Late in August the Southern Counties Gas Co., headquartering in Los Angeles, Calif., was granted a 25-year renewal franchise for gas service in Santa Barbara. Southern Counties under the new franchise will pay the city 2 per cent of its gross annual receipts in Santa Barbara.

Water Heater Manual Published by A. G. A. Committee

THE American Gas Association Committee on Gas Appliance Installation and Service Manuals announces publication of its 203-page Water Heater Manual. The book is approximately 5- by 8-inch size, and contains 95 illustrative figures. As its foreword states, it should be "just as useful as a wrench or a screwdriver," since it brings under one cover all the information needed for properly installing and servicing water heaters. The book sells at $1 per copy.

The subject matter for the water heater manual is arranged under these heads: Part I—Types and Sizes of Water Heaters; Part II—Installation of Water Heaters; Part III —Servicing of Water Heaters; Part IV—Specific servicing instruction for the common types of water heaters and controls.

E. R. Rothert is chairman of the Committee on Gas Appliance Installations and Service Manuals, other members being W. J. Buckley, R. M. Conner, C. R. Miller, T. J. Perry, and C. G. Segeler, secretary.

Cardston, Alberta, Franchise Let

Cardston Gas and Development Co. has been organized at Cardston, Alberta, and now holds a gas franchise to serve that community, according to J. S. Smith of the company. Service is dependent upon success of drilling operations in a field near Cardston.

FAR AHEAD

Two to one against the field, is the preference for Hackney Liquefied Petroleum Gas Cylinders.

There are twice as many in service today, as all others combined.

There are numerous reasons—superior design and workmanship, resulting from the skill and experience of Pressed Steel Tank Company in designing and manufacturing metal containers for leading industries of this country.

From the first, Hackney has supplied cylinders for this field, and numbers among the users such firms as: Shell, Standard, Phillips, Hope, Skelly, etc.

Hackney
MILWAUKEE

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1363 Vanderbilt Concourse Bldg. NEW YORK, N. Y.
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1934
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ORGANIZED PACIFIC COAST GAS ASSOCIATION JULY 11TH 1893

HEADQUARTERS:
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447 SUTTER STREET, SAN FRANCISCO

GEO. P. EGLESTON, PRESIDENT
CLIFFORD JOHNSTONE, MNG. DIRECTOR

CO-OPERATIVE LOAD-BUILDING MONTHLY NEWS ..... AND VIEWS

GAS GUARDS PROFITS

on the "firing line" of STEEL

A "good soldier," GAS! Steady, dependable, obedient, sure! *Enlisted by the steel industry in the war on waste.*

From the entire "Western Front" come favorable reports. "Gas eliminates guess work"..."cuts fuel costs"..."cleaner, quicker, more controllable."

Manufacturers of annealed steel and its alloys . . . foundries, railroad shops, automobile factories . . . use gas. It is preferred by machine tool manufacturers, machine shops, repair shops. Gas helps make better dies and forgings. In heat treating, it stands alone among fuels.

In short, if *your* plant uses *heat* for any purpose, it will pay you to consult your gas company's Industrial Engineers. No charge, of course, for this technical service.

PACIFIC COAST STEEL CORPORATION
(Los Angeles Plant)

As illustrated above, continuous, pusher-type reheating furnaces (for rolling and forging) are equipped with high velocity gas burners in the discharge end of furnace • These contain both primary and secondary air registers, and inspirate all the necessary combustion air for obtaining the proper flame in the discharge area. • Additional gas and air are introduced by a set of side burners in the preheating zone near the charging end.

Quick Clean Economical Gas *the modern industrial fuel*

PACIFIC COAST GAS ASSOCIATION, INC.
(A non-profit service organization of which your Gas Company is a member)
447 SUTTER STREET, SAN FRANCISCO, CALIFORNIA

REDUCED FACSIMILE OF FULL-PAGE AD IN OCTOBER "WESTERN MACHINERY & STEEL WORLD," ONE OF 20 COASTWIDE TRADE JOURNALS CARRYING OUR MESSAGES TO INDUSTRY THIS MONTH.

With the ASSOCIATIONS

Wisconsin Commercial Men Meet at Milwaukee

THE Commercial Section Convention of the Wisconsin Utilities Association, meeting in Milwaukee at Hotel Pfister September 10 and 11, featured the necessity of increasing revenues through appliance sales.

Close to 200 gas men and women attended the single gas session, held on the afternoon of the first day. H. J. Dropp of the Milwaukee Gas Light Co., chairman of the Gas Merchandising Committee of the Association, presided at the meeting, presenting the following subjects and speakers.

"Kitchen Modernization" by Dorothy E. Shank, American Stove Co., Cleveland.

"Air Conditioning" by Lyle Harvey, The Bryant Heater Co., Cleveland.

"Gas Refrigeration" by E. C. Weston, Electric & Gas Utilities, Terre Haute, Indiana.

"New Methods In Water Heating" by C. E. Bartlett, Ruud Manufacturing Co., Philadelphia.

"Merchandising of Gas Ranges" by E. C. Sorbi, Geo. D. Roper Corp., Rockford, Ill.

As the gas session came to a close Mr. Dropp announced that due to the good attendance at the meeting and the enthusiasm with which the program was received, future conventions of the group would schedule more time for the gas session activity.

In keeping with the general theme of the convention, that of the sale of gas, much interest was accorded the exhibits of gas burning appliances which were displayed on the mezzanine floor of the hotel.

A. C. Davey, of the Wisconsin Public Service Corp., Oshkosh, was chairman of the Commercial Section. A. F. Herwig is executive secretary, and G. V. Rork, Northern States Power Co., Eau Claire, is president of the Association.

Competing Fuels Subject of Industrial Session

"MEETING the Competition of Other Fuels" was the topic of general discussion before the periodic gathering of the Midwest Industrial Sales Council of the American Gas Association, held in Chicago, September 21.

C. H. Lekberg, chairman of the Competitive Fuels Committee, led the discussion, dividing the subject into the four sub-topics: Cost of competing fuels and the trend of these prices; new developments in equipment using competitive fuels and new applications using competing fuels; cost analysis and test data on business that has been lost, on business that has been threatened but retained, and on new business that has been added; methods used to meet this competition.

Prior to the conference all members of the Council had been urged to assemble data that would bear on the discussion as outlined, so that all could take an active part in the program.

Representatives of the Peoples Gas Light and Coke Co., Public Service Co. of Northern Illinois, Milwaukee Gas Light Co., Northern Indiana Public Service Co., Laclede Gas Light Co., Wisconsin Power & Light Co., Central Illinois Electric and Gas Co. and Peoples Power Co. attended the meeting.

G. A. Uhlmeyer of Peoples Power Co., Moline, is chairman of the Council, H. J. Monroe of the Milwaukee Gas Light Co. is vice-chairman, and P. W. Hay of the Public Service Co. of Northern Illinois at Harvey is secretary and treasurer.

Safety Congress in 23rd Session October 1-5

BETWEEN 6,000 and 8,000 delegates from the United States and foreign countries are expected to attend the 23rd annual Safety Congress and Exposition at Cleveland, Ohio, October 1-5, under the auspices of the National Safety Council.

Separate programs have been prepared for practically every branch of industry, educational institutions, traffic authorities, etc.

The address of welcome to the Public Utilities Section will be made by C. E. Gallagher, president of The East Ohio Gas Co., Cleveland. Among the papers to be presented during the sessions are included "Poisonous Gases and Their Effect," by William P. Yant, supervising engineer, Pittsburgh Experimental Station, U. S. Bureau of Mines and "Fire Prevention in the Public Utility Industry," by T. Alfred Fleming, supervisor conservation department, National Board of Fire Underwriters, New York City.

A feature of the Congress will be an exposition of safety equipment and appliances developed during recent years for the protection of industrial workers.

1934 Calendar

October

National Safety Council - American Society of Safety Engineers—Joint Sessions, Cleveland, Statler, Carter and Hollenden Hotels, Cleveland, Ohio, October 1-5.

Southern California Meter Association—Lakewood Golf Club, Long Beach, Calif., October 25.

Pacific Coast Gas Association—41st Annual Convention, Hotel Del Monte, Del Monte, Calif., October 9-12.

American Gas Association — 1934 Annual Convention, Atlantic City, N. J., Week of October 29.

November

American Petroleum Institute—1934 Annual Convention, Baker and Adolphus Hotels, Dallas, Texas, November 12-15.

Annual Exhibitors' Night, Southern California Meter Association, Los Angeles, Calif., November 22.

P.C.G.A. Program Set for Oct. 9-12 Convention

THE program of the Pacific Coast Gas Association convention, scheduled for October 9-12 at Del Monte, Calif., stands as published in the September issue of *Western Gas,* with the following additions:

The Manufacturers Section will meet Tuesday afternoon, October 9. The chief purpose of this session will be to hear a report on Code progress from members of the Section who attended the annual meeting of Gas Appliances Institute which took place in Chicago on September 17.

The meeting of the Accounting Section scheduled for Wednesday afternoon, October 10, will include a paper by J. Q. Ewing, assistant auditor of Southern California Gas Co., entitled "Coordination of Paper Work Between Purchasing, Receiving and Disbursing Departments."

Following is the full program arranged for the Manufacturers Section:

Address of Chairman: E. L. Payne, Payne Furnace and Supply Co.

Discussion of Present Status of NRA Codes: Led by C. A. Swigart, Pacific Coast Gas Association.

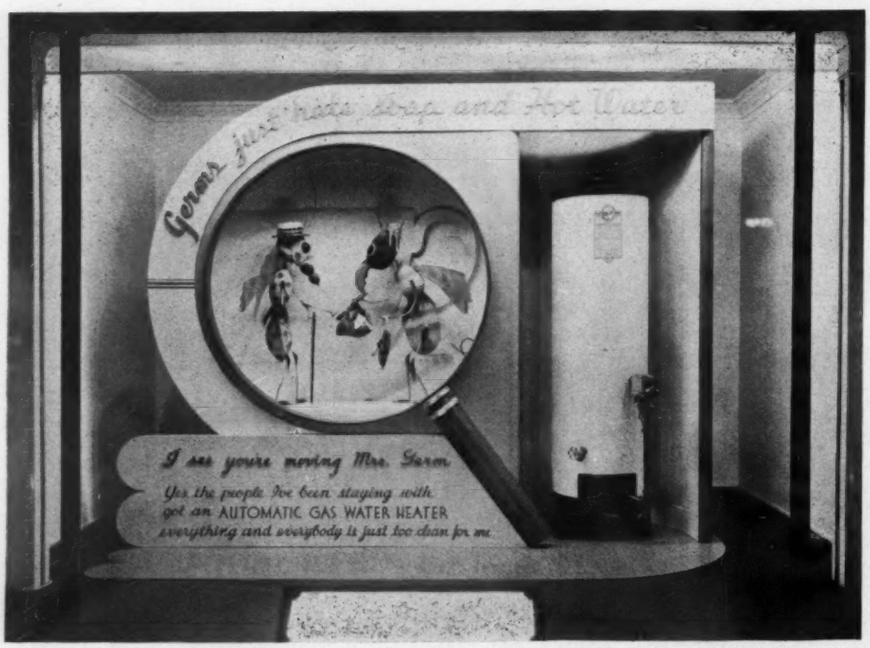
Discussion of Plan through which Manufacturers Can Work with Utilities to Promote a Larger Volume of Gas Appliance Sales: Led by A. F. Rice, H. R. Basford Company.

Discussion of A.G.A. Laboratory Requirements and the Desirability of Combined Action of Manufacturers in Offering Constructive Criticisms: Led by F. E. Vandeveer, Supervisor Los Angeles Branch, American Gas Association Laboratory.

A.G.A. and P.U.A.A. Join in Ad Conference at Atlantic City

The Public Utilities Advertising Association and the Publicity and Advertising Committee of the American Gas Association will meet in joint session at "A Brass Tacks Conference on Advertising" November 1, at Atlantic City, during the A.G.A. annual convention. Henry Obermeyer, president of the P.U.A.A. and chairman of the Publicity and Advertising Committee of the A.G.A., will preside at the conference.

Among the subjects scheduled for discussion are included these: Promotional Possibilities of the A.G.A. Laboratory Seal, Selling Industrial Gas by Direct Mail, Advertising in Competition with Government Sponsored Business, National Advertising Sometime vs. Regional Advertising Now?


Germs just hate soap and Hot Water
I see you're moving Mrs. Germ
Yes the people I've been staying with
got an AUTOMATIC GAS WATER HEATER
everything and everybody is just too clean for me

They Stop . . . Look . . . and Laugh . . . When They See This Display

IF YOU take one cool, clear selling point; build it up with imagination and add a dash of harmless humor you are likely to have the makings of an interesting advertisement. If you then carry out the idea in three dimensions, taking care that the execution of the job supports the original thought in construction and treatment, you have an advertising unit that should make a very good window display.

This is probably the formula used by Harry Swenson, Director of Displays for The Peoples Gas Light and Coke Co. who designed the eye-fetching display advertising an automatic gas water heater in one of this company's recent Michigan Avenue windows. The photograph on this page shows this amusing exhibit that actually makes people stop, look and laugh.

Shown in effect through a giant magnifiying glass are two good sized microbes silhouetted against a teacup. Obviously it is a meeting of old friends, for the pleasantries of social conduct are being observed.

A dapper, though somewhat shaky gentleman microbe is addressing a fluttery lady germ. She, for the millinery confection on her head indicates the female of the species, is to all appearances on her way to other parts and the departure has been hurried, judging by the state of her baggage.

The gentleman germ appreciates this for according to the copy below this interesting pair, he says: "I see you're moving, Mrs. Germ," and she, the copy continues, answers: "Yes, the people I've been staying with got an automatic gas water heater; everything and everybody is just too clean for me."

A bacteriologist might quarrel with the designer about the contours of the germs, he may even reproach him for showing the gentleman germ so smart in straw hat and cane, and he may point out and rightfully too, that lady microbes are seldom seen carrying umbrellas. But all these frivolous fictions are of course charged to designer's license and show a pleasant degree of imagination. Perhaps we had better mention that the colors and expressions of the beasts are very amusing; there are spots and dots of yellow and green, there are whiskers and wings and by means of a simple unseen mechanical contrivance the figures are made to nod and wiggle to further the illusion of earnest conversation.

No one casting an eye at the display can fail to get the message printed clear and large: *"Germs Just Hate Soap and Hot Water"* nor can they ignore the actual Water Heater standing along side, yet very much a part of the picture.

There are always people enjoying this display, women and children are quick to see it, the passerby, even though in a hurry, stops and chuckles. It is the sort of thing that makes dinner table talk in the evening; "I saw the funniest window at the Gas Company today, they were showing a Water heater and" . . . . when they do that the display is a success!

H. F. Patterson Goes With Cribben & Sexton

H. F. Patterson at one time vice-president in charge of sales for Moore Bros. Co., Joliet, Ill., and more recently associated with Faraday Refrigerator Corp. of Dayton, Ohio, has joined Cribben & Sexton Co., Chicago, as special utility contact representative. In his new position Mr. Patterson will work directly under Frank J. Hoenigmann, general sales manager of the company.

W. C. Beckjord Vice-President and General Manager for Columbia

WALTER C. BECKJORD, formerly vice-president and general manager of the Boston Consolidated Gas Co., has been elected to the recently created position of vice-president and general manager of the Columbia Gas and Electric Corp., N. Y., according to announcement in September.

Four additional directors were elected to the board: Mr. Beckjord; Edward Reynolds, Jr., the executive vice-president; C. I. Weaver, a vice-president; and Frank M. Tait, president of the Dayton Power and Light Co. The elections added three directors to the board, which now consists of 21 members, and filled the vacancy caused by the resignation several months ago of Charles A. Munroe.

Mr. Beckjord was graduated in 1909 from the University of Minnesota, having worked during summer vacations as cadet engineer for the St. Paul Gas Light Co. After graduation he became construction engineer for the St. Paul utility, and left in 1916 to become assistant engineer for the American Light & Traction Co. In 1922 he was elected vice-president and chief engineer of the latter company. He became vice-president and general manager of the Boston Consolidated Gas Co. in 1929.

He is a director of the American Gas Association, has served two terms as chairman of the Technical Section, and one term as chairman of the Commercial Section.

E. M. Farnsworth, Jr., president of The Old Colony Gas Co., East Braintree, Mass., has succeeded Mr. Beckjord in Boston.

Prize-Winning Utility Ads Available In Brochure Form

The Public Utilities Advertising Association, announces publication of its 1934 brochure containing prize-winning public utility advertisements, newspaper and poster. The brochure sells for $1.50 a copy and may be obtained from Howard F. Weeks, treasurer of the Association, c/o Consolidated Gas Co. of New York, 4 Irving Place, New York.

W. E. Leverette Sales Manager Nashville Gas and Heating Co.

W. E. Leverette has been appointed sales manager for the Nashville (Tenn.) Gas and Heating Co., according to S. E. Linton, president of the company. Mr. Leverette was formerly sales manager for the New Bedford (Mass.) Gas and Edison Light Co., and has also been connected with the Alabama Power Co. and the Broad River Power Co.

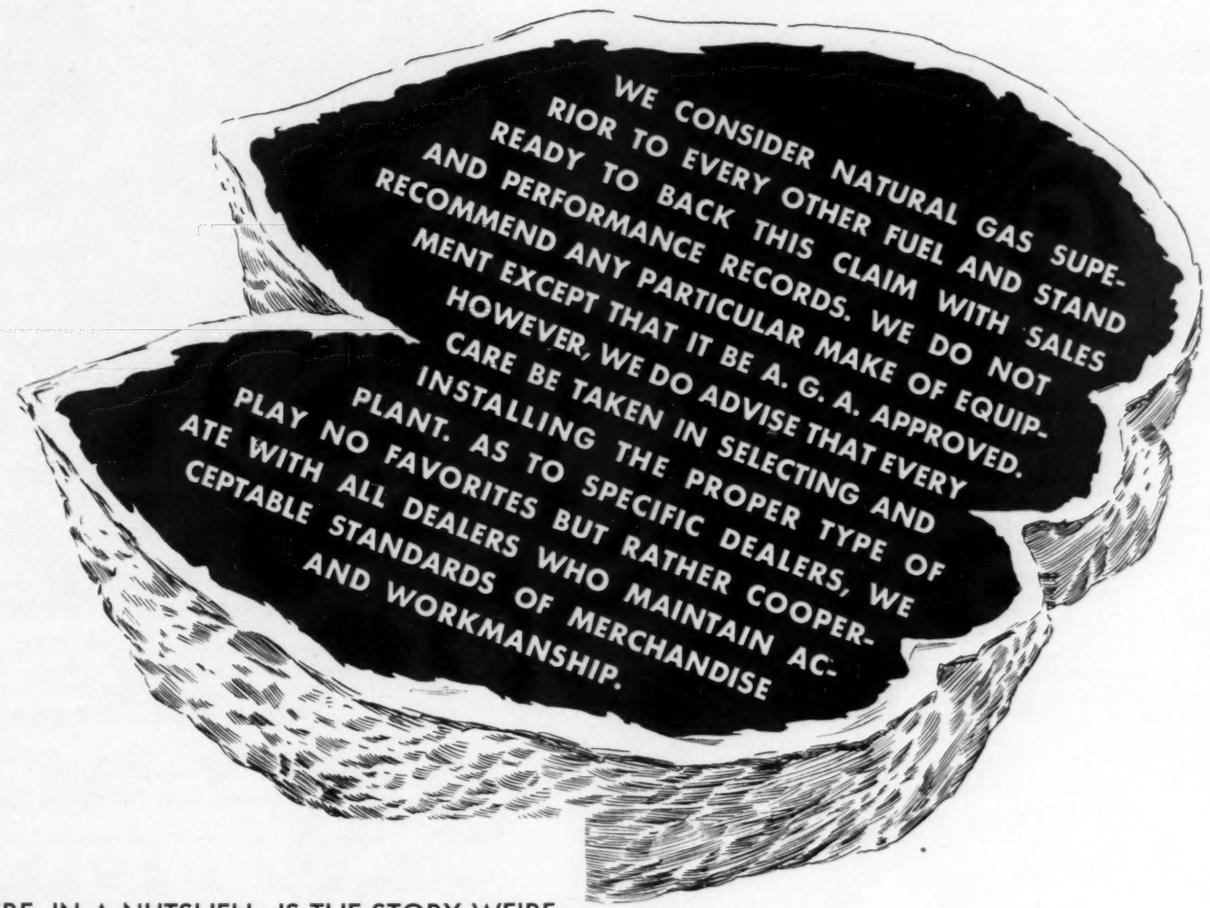
Brinkley and Van Slyke In Oklahoma Natural Changes

George W. Brinkley, former local manager for the Oklahoma Natural Gas Co. at El Reno, Okla., has been made district manager for the company at Ardmore. C. M. Van Slyke, field superintendent at Chickasha, succeeds Mr. Brinkley at El Reno.

Mixed Gas Near for Minneapolis

Northern Natural Gas Co. in September began actual construction of the 20-mile addition to its pipe line system, which will bring natural gas to Minneapolis, Minn soon to be put on mixed gas service.

IN A *nutshell*


WE CONSIDER NATURAL GAS SUPERIOR TO EVERY OTHER FUEL AND STAND READY TO BACK THIS CLAIM WITH SALES AND PERFORMANCE RECORDS. WE DO NOT RECOMMEND ANY PARTICULAR MAKE OF EQUIPMENT EXCEPT THAT IT BE A. G. A. APPROVED. HOWEVER, WE DO ADVISE THAT EVERY CARE BE TAKEN IN SELECTING AND INSTALLING THE PROPER TYPE OF PLANT. AS TO SPECIFIC DEALERS, WE PLAY NO FAVORITES BUT RATHER COOPERATE WITH ALL DEALERS WHO MAINTAIN ACCEPTABLE STANDARDS OF MERCHANDISE AND WORKMANSHIP.

HERE, IN A NUTSHELL, IS THE STORY WE'RE TELLING IN PROMOTIONAL ADVERTISEMENTS. NOTHING ELSE IS EITHER SAID OR IMPLIED : : : : : : : :

No makes, no prices, no terms, no exclusive features, no discriminating statements—nothing whatever that might prevent you from publishing your own advertisements alongside. Our copy is written primarily to "sell the idea" and to help you sell the merchandise. It's doing both. We're sure of this because dealers have told us so. And our own records prove it . . . . records which trace month by month the origin as well as the volume of sales throughout our system. To be sure, this doesn't mean that all dealers are benefiting by P. G. and E. advertising. But it does mean that those dealers who are using it are finding it exceedingly helpful. If you are one of them you know what we mean when we say "Tie in!" If you are not, we suggest that you learn more about this new technique in appliance advertising. Our local office will gladly explain.

WG 210-1034

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

Owned · Operated · Managed by Californians

Indexes or Cost Translators in Utility Appraisals

(Continued from Page 13)

mind with a new outlook. Even if we had that unattainable thing, a perfect index series for "the general price level," and even if that impossible situation existed of having identically the same old property to be valued, still we could not apply the index to the old judgment value and so easily find today's judgment of value. The result might be either too high or too low and we would have no way of knowing which. The old value was an adjudicated figure for the old property; but that property has changed. Seldom can anyone look back searchingly enough to see what parts of the old value apply to the remaining parts of the property. And moreover, the physical separation of disappeared items from remaining items may have altered the old ratios of value.

It should be obvious that general commodity price indexes are not applicable to appraisal work on utility property because first, these commodity indexes are not based on data which represent the commodities which enter utility properties to any considerable degree. Secondly, the weighting of such commodities as might appear in the utility property does not correspond to the importance of the commodity in the utility property. Third, the commodity index neglects the influence of labor on highly fabricated production like machinery and the further influence of labor on installation and construction. The effect of these labor items is to reduce the fluctuations shown by commodities. Furthermore, the more labor there is applied, the more there is attached of stable elements like taxes, rent and other fixed charges.

The logical course seems to be for the present reviewing authority to exercise anew its present-day judgment of today's value as today's property, having before it today's evidence of book or historical costs, today's reproduction costs, and today's expectation as to the trend of similar construction costs. This valuation process is not easy; it is not quick; but it is sound and equitable, for we know upon what foundations a decision is built.

Effect of Property Changes; Additions and Retirements

That statistical formula for the quick and easy ascertainment of present value first described is weak in its introduction of property changes. In addition to its main feature of applying a general translator to the old adjudicated value, it applies similar cost translators year by year to net increases (or net decreases) in fixed capital as shown in the accounts.

Those net increases or decreases are themselves the resultant of gross additions and gross retirements. If index numbers or translators could be applied at all, one certain translator would apply to one year's gross additions of plant, while that year's individual retirements would demand translators determined for the years when those retired items were constructed. The charming simplicity of the formula falls away rapidly.

Extensive National Advertising Under Way for Minneapolis-Honeywell

Minneapolis-Honeywell Regulator Co. is running a current national advertising campaign consisting of full pages and smaller space in a group of the more important national magazines and in rotogravure sections of 15 large metropolitan newspapers. Immediate purpose of the campaign is to build business in which architects, engineers, heating dealers of all kinds, air conditioning dealers and contractors will share.

P. G. and E. Tax Bill Takes 13 Per Cent of Gross Revenue

Pacific Gas and Electric Co.'s 1934 state tax bill comes to $7,427,678.64—something over $20,000 a day, $847.91 per hour. It amounts to 9 per cent of the company's gross revenue for the year ending December 31, 1933. It is estimated that the company's combined taxes in 1934 will take 13 cents of every dollar of gross revenue.

The D F C Automatic Combustion Control

- wipes out all preventable stack losses
- holds steam pressure within 2% plus or minus
- holds CO_2 at highest point, excess air at lowest point possible to equipment controlled.

Match the efficiency records of other plants — write for Bulletin 320W.

The Denver Fire Clay Company

Denver, Colo.

Branches at Salt Lake City, El Paso and New York City

22 L. A. G. and E. Workers Retire Under Pension-Benefit Plan

WITH service records ranging up to 44 years, 22 employees of the Los Angeles Gas and Electric Corp. retired September 1, in accordance with the company's pension and benefit plan. Oldest in point of service is S. E. Bangerter who has seen continuous service with the company for 44 years. C. A. Bartlett has been affiliated for nearly 39 years.

A total of 102 persons now have received annuity pensions under the L. A. G. and E. plan, according to Addison B. Day, president and general manager of the company.

Mr. Day himself, who started with the company as a gas appliance salesman in 1895, has a 40-year record of continuous service with the Los Angeles Gas and Electric Corp. Rising through the ranks, he became president and general manager in 1928.

Peoples Gas Light & Coke In Safe Driving Record

Indicating the emphasis placed upon public safety in operation of the Peoples Gas Light and Coke Co., 143 automobile drivers, from three gas company departments, have traveled 528,228 miles this year without a single chargeable accident marked against them. The three departments are the Refining Plant, the Stores department and the South Shop.

The Refining Plant drivers had one accident charged against them in August, 1933, the first since 1929. Stores department drivers have a perfect driving record since 1932.

This excellent work on the part of the gas company drivers is especially significant at this time, in the wake of the recent Chicago traffic figures which show that automobile accidents have increased 52 per cent since the first of this year.

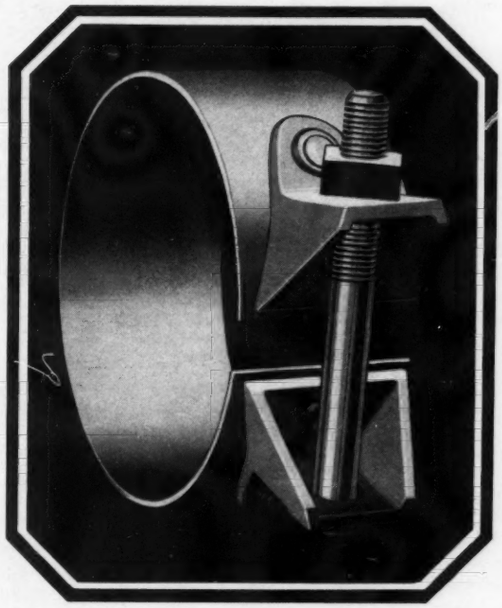
Approximately 250 gas company automobiles and trucks are on the street every day and to date, these cars have traveled a total of 1,216,580 miles since the first of the year.

Municipal Utilities Should Be Non-Profit, Says N. Y. Commission

New York Public Service Commission's decision of August 16, in the matter of the Boonville, N. Y., municipal electric property is of considerable interest to public utilities, since it holds in its primary finding that a municipality in the state of New York may not charge higher rates than necessary to cover cost of service. In rejecting the view that the Boonville plant should pay into the village treasury a return on the investment put up by taxpayers the Commission held that when once consumers have paid for municipal utility property out of rates, and public funds obtained from other sources have been fully reimbursed, there should be an end to capital charges.

Michigan Development Under Way

Construction work on the American Light & Traction Co. natural gas pipe line from the Austin pool in Mecosta County, Mich., to Muskegon, got under way September 17. The line will cost approximately $500,000 to construct.



THE DAYTON BAND CLAMP offers a simple and economical, yet very effectual method of permanently sealing small leaks in either welded joints or in the pipe itself.

Inexpensive, easily and rapidly applied, and efficient in use—the Dayton Band Clamp conforms to the same high standard of unfailing service as all other Dayton products.

Made in all standard sizes from 2 to 26-inch O. D., including casing sizes.

THE NATIONAL-SUPERIOR CO.
DAYTON PIPE COUPLING DIVISION
DAYTON, OHIO

BARBER
Automatic Jet Gas
BURNERS
for
WARM AIR FURNACES
and
Steam and Hot Water Boilers

Illustrating a No. 324-B Barber Automatic Burner installed in a round combustion chamber. Note the proper position of the burner; its simplicity of installation and the excellent heat-producing scrubbing action of the flame.

Barber Conversion Burners are supplied with the Spencer Klixon No. C-1888 Safety Pilot Control, which is backed by years of research and development. It is a positive and accurate device. Ignition of the Barber Burner Units is made within one minute and the complete shut-off in the event of gas or current failure is made within two minutes.

There is none better than the Barber Automatic Gas Burner and Barber Pressure Regulator for warm air furnace Gas Conversion jobs, nor for standard burner equipment for new furnaces, boilers and appliances.

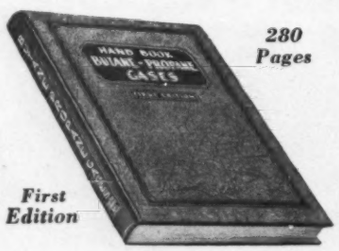
Barber's line of gas burners includes specially designed equipment for warm air heating and air conditioning systems. Make it your answer to the new-day demand for completely automatic heat.

Write at once for full information—NEW CATALOG and latest ATTRACTIVE DISCOUNTS, SELLING CO-OPERATION, ENGINEERING CO-OPERATION in specifying proper arrangement of Barber Burner Assemblies for your particular requirements.

THE BARBER GAS BURNER CO.
3704 Superior Ave. Cleveland, Ohio

A COMPLETE REFERENCE ON

BUTANE-PROPANE GASES



280 Pages

First Edition

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- Physical Properties of the Liquefied Petroleum Gases.
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- The Use of Butane and Propane with Manufactured Gas.
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- Central Plants for Undiluted Butane-Propane Vapor Service.
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ORDER NOW

Send $5.00 to WESTERN GAS, 810 South Spring St., Los Angeles, Calif.

Off-Peak Sales Drive Gets Results

By WINFIELD FOSTER

The Peoples Gas Light and Coke Company

THE use of gas for summertime water heating and steam generation by Chicago hotels, apartment buildings, and office buildings, has been more than doubled within the past year through the sales efforts of the industrial department of The Peoples Gas Light and Coke Co.

Concurrently with the company's drive to sell gas for house heating, this campaign to sell gas for summertime uses was begun. Under the terms of the Peoples Co.'s contract with the Natural Gas Pipeline Co., which includes a capacity charge as well as a commodity charge, it was found advantageous to balance the yearly load as nearly as possible.

For this purpose, two new rates were put into effect, specifying very low prices for gas used during the months of April, May, June, July, August, September and October and almost prohibitive prices for gas used under these rates during the months of November, December, January, February, and March.

In many cases industrial salesmen of the Peoples Co. have been able to show building owners and managers an actual cash saving by switching to gas for summertime uses. This saving takes into account the fact that boiler room labor is dispensed with, and is also partially due to the fact that a great many buildings have been forced to operate their wintertime heating equipment at low capacity and consequently at low efficiency, merely to supply hot water needs of the building tenants during the summertime. The connected load developed through this sales activity, which was conducted under the direction of Theodore V. Purcell, vice-president in charge of sales, and D. W. Chapman, manager of industrial gas sales for Peoples Co., amounts to approximately 4,000,000 therms per year.

Although downtown office buildings have formed the major part of this load, a promising field seems to be offered by hotels and apartment buildings in some of the outlying neighborhoods. Thus, the Edgewater Beach and Ambassador Hotels and the Marshall Field Garden Apartment homes are among the users of gas under this rate.

The achievement of the Peoples Co. in expanding this market is the more noteworthy when it is remembered that a fairly substantial investment is required to convert heating plants to use gas, and that, because of the rental situation prevailing in Chicago as well as in other metropolitan centers, building managers have generally been reluctant to commit themselves to any capital expenditures whatever. A number of Chicago apartment buildings, as well as office buildings, are operating under receiverships and so did not have the interest in improving their facilities that a building operated under private management would have. Any improvement in this situation should have a very good effect on the company's market in this field.

Denver Utility to Cash In on Rate Reduction

COINCIDENT with a rate reduction of 8 cents per M c.f. for all gas consumed by residential customers in excess of three M c.f. per month, the Public Service Co. of Colorado during September put under way a gas househeating and storage water heating activity. According to Roy G. Munroe, gas new business manager for the company, the drive is expected to bring back onto the lines a great many former house heating customers who have turned to cheap coal during the depression period.

The campaign got off to a good start with large space newspaper advertising, 42 billboards carrying gas heat and hot water messages, and frequent radio broadcasts over all four of Denver's stations. Territory sales representatives are also provided with pocket-size booklets entitled "Gas Heat Proves Its Economy in Nearly 10,000 Denver Homes."

By September 12 the campaign had already added 143 house heating installations and 39 automatic storage water heaters, in addition to about 150 fireplace heaters. Sixty-six of the house heating orders were resales to former customers, not involving purchase of additional equipment.

Liberal Sales Plan on Conversion Burners

THE Gas Service Co., Kansas City, Mo., will sell conversion burner equipment this season for cash or on term accounts, with the agreement that all money paid on the equipment will be refunded if the customer is not entirely satisfied with the heating results obtained during the approaching winter. The customer must determine before June 1, 1935, whether or not he wishes to turn back the equipment. According to F. M. Rosenkrans, new business manager for the company, approximately 2,000 burners should be sold under the new plan.

The conversion burner job to be installed under the above plan includes an improved Minneapolis-Honeywell Regulator Co. thermostat, a secondary air control, radiator baffles and a complete adjustment with Orsat equipment.

In addition to special newspaper advertising of the plan, a letter will be sent to all prospects for conversion burner equipment, outlining the details of the offer and inviting the prospect to request an interview with a company representative.

DIRECTORY

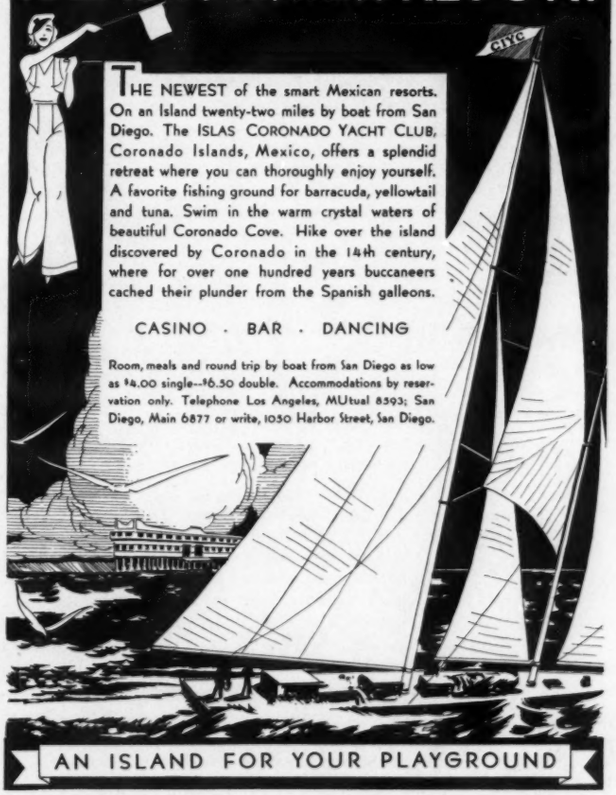
Byllesby Engineering and Management Corporation

Wholly-owned subsidiary of Standard Gas and Electric Company

231 South La Salle Street, Chicago
New York Pittsburgh San Francisco

• HYDRAUGER •
MODERN HORIZONTAL BORING MACHINE
For Underground Installation of Pipe and Conduits. Avoids damage to costly Pavements and saves time. Send for Bulletin.
HYDRAUGER CORPORATION, Ltd.
343 Sansome Street • San Francisco, California

ISLAS *Coronado* RESORT



THE NEWEST of the smart Mexican resorts. On an Island twenty-two miles by boat from San Diego. The ISLAS CORONADO YACHT CLUB, Coronado Islands, Mexico, offers a splendid retreat where you can thoroughly enjoy yourself. A favorite fishing ground for barracuda, yellowtail and tuna. Swim in the warm crystal waters of beautiful Coronado Cove. Hike over the island discovered by Coronado in the 14th century, where for over one hundred years buccaneers cached their plunder from the Spanish galleons.

CASINO · BAR · DANCING

Room, meals and round trip by boat from San Diego as low as $4.00 single--$6.50 double. Accommodations by reservation only. Telephone Los Angeles, MUtual 8393; San Diego, Main 6877 or write, 1050 Harbor Street, San Diego.

AN ISLAND FOR YOUR PLAYGROUND

"MODERNIZE as you repair"

THE SPRAGUE METER COMPANY

BRIDGEPORT, CONN.

Los Angeles, Calif. San Francisco, Calif.

Davenport, Iowa.

Newark, Ohio. Houston, Texas.

The heater that smiles while it warms

FRASER

Radiant Front Console

Imagine a circulating heater with all the added advantages of a cheerful open fireplace. It is absolutely new—a revolutionary contribution to gas heating.

Manufactured by

Fraser Furnace Company
Stockton, California

Distributed by

H. R. Basford Company
San Francisco Los Angeles

Lone Star Begins Work on 70-Mile Line

THE first major construction work undertaken by the Lone Star Gas Co. in five years is now under way. A 70-mile line of welded 12-inch gas pipe will be laid across five Texas counties from a point south of Waco into the gas fields in the proven area of Long Lake in Anderson County, representing an investment of almost a million dollars.

Construction of the new line, which will be completed about December 1, is planned in anticipation of increased demand during the coming season, according to Frank L. Chase, vice-president of the Lone Star Gas Co. in charge of operations.

This additional line further strengthens the 4,000-mile network of pipe lines in the Lone Star gas system, and will increase capacity by 30,000,000 cubic feet of gas a day, supplying the southern end of the system with a double protection by drawing gas from a new source of supply in addition to the existing lines from the West Texas fields.

Gas will be taken from the field at high pressure and no compressor stations will be necessary at this time.

Work of building the line will be under the direction of Frank L. Chase, vice-president, and will be supervised by Elmer Schmidt, general superintendent of the Lone Star Gas Co., Julian L. Foster, chief engineer, R. Vandercook, superintendent of pipe lines, and Luther Tolbert, assistant superintendent of pipe lines for the company.

The new line will tie into the company's pipe line system at a point south of Waco and also at a point near Groesbeck. It will run south of Teague, through Dew, make a submerged crossing of the Trinity River at a point north of the highway bridge on State Highway 43, and on into the Long Lake fields. The line will run through McClellan, Falls, Limestone, Freestone counties, across the Trinity River and into the southwest of Anderson county.

All 12-inch pipe used in construction of the new line will be moved from other locations on the system. It will be cleaned at concentration points from which it will be shipped to pipe line location. It will be given a second cleaning after the pipe has been welded and placed on skids over the ditch.

B. P. Stockwell Succeeds Hassler on Oklahoma Commission Staff

B. P. Stockwell was made head of the gas and electric engineering department of the Oklahoma Corporation Commission September 1, succeeding John J. Hassler, who resigned to become secretary to Paul A. Walker, chairman of the telephone division of the Federal Communications Commission.

From 1921 to 1927 Mr. Stockwell held this same position with the Oklahoma Commission, resigning it to become manager of the Oklahoma Utilities Co. He later became manager of the Oklahoma-Kansas division of the Empire Public Service Corp. He graduated from the Engineering department of the University of Oklahoma in 1918 and for three years was a member of the staff of the Illinois Commerce Commission. For the past two years he has been engaged in gas rate work.

Electrolux Health Booklet for Utility Distribution

"Cold Facts About Health" is the title of a booklet prepared under the direction of Jane Tiffany Wagner, head of the home service department of Electrolux Refrigerator Sales, Inc., New York, N. Y., for distribution by the home service departments of gas companies. It describes various ways in which an Electrolux refrigerator can be used in the home as an aid in promoting and preserving health from babyhood on, or as a help in time of sickness. Recipes for appetizing dishes for convalescents are also included in the booklet.

Wants Position with Southern or Mid-Western Gas Co.

Western Gas has received an inquiry from a gas man, 36 years old, with 14 years experience in natural gas distribution work as meter reader and repairman, cashier, bookkeeper and district manager, who desires to secure a position with a gas company in the south or middle west. Further information will be given by *Western Gas* upon application.

Guymon System Nearly Complete

The municipal gas distribution system under construction at Guymon, Okla., is scheduled for completion the latter part of October.

ROBERTSHAW

"Automati Cook"

You Can't Expect Robertshaw Results Unless the Robertshaw Name is on the Dial.

ROBERTSHAW THERMOSTAT CO.
Youngwood, Pa.

The Goodman Stopper

The Reliable Shut-off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

Safety Gas Main Stopper Co.
523 Atlantic Avenue, Brooklyn, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street
San Francisco, California

Service Connections to Cast Iron Pipe

(Continued from Page 12)

tained by brazing but is not recommended for field use.

The American Cast Iron Pipe Co. claims that arc welding does not offer any advantage over bronze welding and does not give as good results. One electric welded connection made by the Los Angeles Gas and Electric Corp. gave very poor bond.

Needless to say, there has been very little published work done on mechanical service connections to cast iron pipe. Along with the pipe the industry has accepted the manufacturer's recommendation to use a threaded connection for low-pressure and semi-high-pressure, and where high-pressure was encountered to use the conventional saddle or clamp as has been used on steel pipe.

Cast iron service clamps produced this year by the American Cast Iron Pipe Co. have considerable merit, particularly where graphitized cast iron pipe is encountered. Ample material in both clamps and bolts has been allowed to prevent distortion, and bolts are made of a high strength cast iron. There has been produced by this same company and also by most of the other cast iron companies and coupling manufacturers a boltless coupling made of cast iron which will allow an entire main and service to be run without the use of a welding torch. Most of these couplings have been produced only to a 2-inch size, though the National Cast Iron Pipe Co. has successfully made them up to 6-inch.

With the cooperation of the National Cast Iron Pipe Co., and Mr. Carson of the Carson-Cadillac Corp., we have produced a mechanical service connection which may be attached to the inside of the pipe, and may be used on pipe with considerable graphitization.

Fig. 3 shows a print of this fitting to be used in high-pressure connections. This fitting is designed to apply the connection without the loss of gas. A drift pin is used to expand the lugs.

For low-pressure, this fitting will be clamped to the pipe by means of outside nut as shown on Fig. 4. Note the method of attaching the service piping to this fitting. This method will also be used in the high-pressure fitting unless a beveled end for welding is found more desirable.

As may be seen in the low-pressure fitting, there will be no machine work, even the threads, which in themselves will not be required to be gas-tight, will be cast.

It will be noted that this fitting does not depend on using the inside wall of the pipe as a fulcrum to expand the lugs nor as a bearing point for the fitting to secure itself, but offers a 90 degree pull against the side wall of the cast iron pipe. Thus there is no tendency for the sharp edges of the pipe wall to sluff away with movements of the service pipe and thus loosen the fitting. It will also be seen that the lugs run longitudinally with the pipe, and thus are not affected by the inside pipe contour, as would be the case if they ran in the plane of the pipe diameter.

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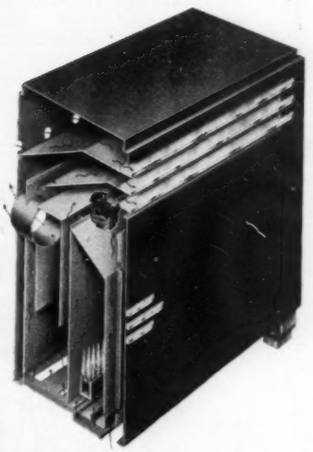
AMERICAN GAS ASSOCIATION · COMPLIES WITH NATIONAL SAFETY REQUIREMENTS · APPROVED ·

Vented installation recommended, but A.G.A. approved, either WITH OR WITHOUT vents.



THE new Payne Moderne Console Heater embodies the latest trend in attractive design and heating efficiency. It may be installed in any home where rapid delivery of pure, warm air is desired. It employs double wall insulation and provides absolute safety at all times. Because of its design it extends closer to the floor than other types and eliminates disagreeable floor drafts, throwing a stream of freshly warmed air into the central area of the room. Payne Console Heaters are available in various sizes for home and office installation.

Write for descriptive circular.

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Beverly Hills, California
SINCE 1912

The Payne Console Heater is available with either manually or thermostatically controlled burner or with a throttling type thermostat which turns the gas flame off when a pre-determined room temperature has been reached. All control units are within the cabinet and easily accessible.

Payne Console Heaters

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General Ceramics Refractories are made to exacting standards of accuracy and uniformity. That is why they are being used by the leading manufacturers of conversion burners, space heaters, and circulating heaters. Our engineers will gladly cooperate on new designs, alterations, production economies, etc.

General Ceramics Company, 71 West 35th Street, New York

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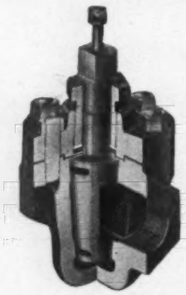
PLUG
VALVES



Cut-away view of Nordstrom Lubricated Plug Valve. Made in sizes from 1/2" to 30", in various metals. Also made with face-to-face dimensions same as gate valves, 2" to 12" permitting installation without altering pipe dimensions.

MERCO NORDSTROM VALVE CO.
A Subsidiary of
PITTSBURGH EQUITABLE METER CO.
Main Offices: Pittsburgh, Penna.
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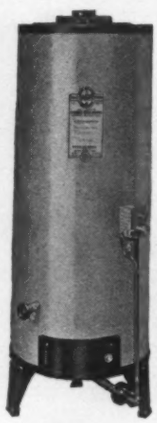

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WATER HEATERS

Three models of quality water heaters at a price range to meet any campaign requirement. Each combines the highest efficiency with improved principles of design and sturdy construction. Perfectly controlled, highly efficient, yet lowest in price for comparable quality.

A. G. P. made in galvanized or Everdur tanks—20-25-30-40-75 gallon sizes.

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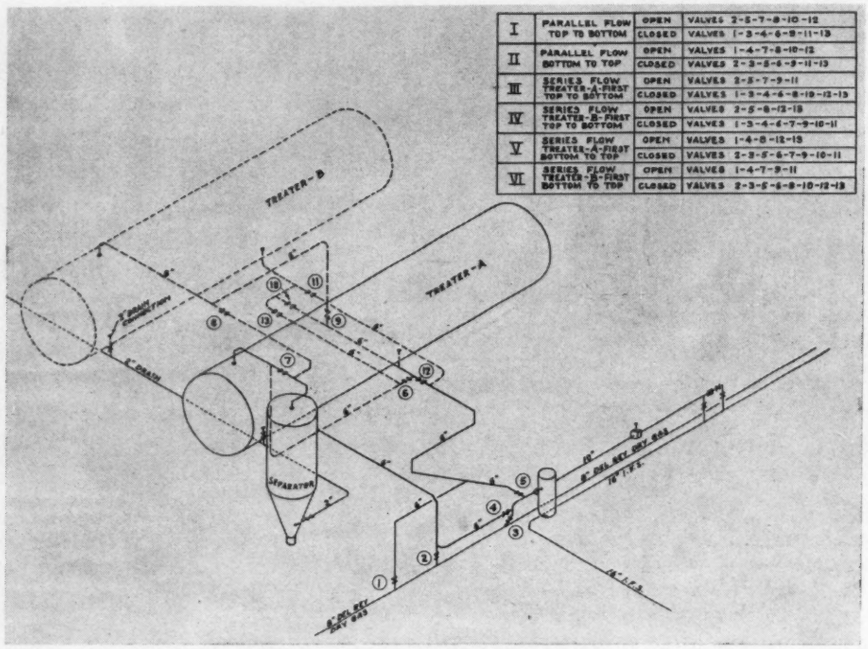
I PARALLEL FLOW TOP TO BOTTOM OPEN VALVES 2-5-7-8-10-12 CLOSED VALVES 1-3-4-6-9-11-13
II PARALLEL FLOW BOTTOM TO TOP OPEN VALVES 1-4-7-8-10-12 CLOSED VALVES 2-3-5-6-9-11-13
III SERIES FLOW TREATER-A-FIRST TOP TO BOTTOM OPEN VALVES 2-5-7-9-11 CLOSED VALVES 1-3-4-6-8-10-12-13
IV SERIES FLOW TREATER-B-FIRST TOP TO BOTTOM OPEN VALVES 2-5-8-12-13 CLOSED VALVES 1-3-4-6-7-9-10-11
V SERIES FLOW TREATER-A-FIRST BOTTOM TO TOP OPEN VALVES 1-4-8-12-13 CLOSED VALVES 2-3-5-6-7-9-10-11
VI SERIES FLOW TREATER-B-FIRST BOTTOM TO TOP OPEN VALVES 1-4-7-9-11 CLOSED VALVES 2-3-5-6-8-10-12-13
TREATER-B
TREATER-A
SEPARATOR

FIG. 5. Flow sheet of purification plant.

Removing Hydrogen Sulphide from Natural Gas

(Continued from Page 16)

tion plant. It will be observed that the piping is so installed that the flow can be directed in several ways. It was thought advisable to provide for this as it is known that absorption does not take place at a uniform rate throughout the bed.

VI. Results of Purification

The first unit of the plant was put in operation on January 11, 1934 and the second unit on May 16, 1934. Both units have since been in continuous operation. Daily lead acetate strip tests are made as well as Orsat analyses for air and carbon dioxide.

Tests were made on the individual units on May 28, by the Union Oil chemist. The results obtained are shown in Table No. 5. When these tests were made, the gas was flowing down through the old unit (A) and then down through the new unit (B).

Although the gas has not been purified for a sufficient period to permit a mathematical comparison of the number of copper pilot stoppages, our service men have reported a noticeable decrease of same since the first of the year. It is doubtless true that the concentration of hydrogen sulphide remaining in the gas after purification would cause serious internal corrosion in transmission lines at pressures above 100 lbs. in the presence of liquid water.

While the purification plant has apparently functioned properly up to the present time, it is still not known whether sufficient reactification can be accomplished in place by the addition of small quantities of air to assure the charge of oxide lasting one year.

VII. Cost of Purification

As the purification plant was constructed largely from equipment on hand, the cost was relatively low, amounting to approximately $3,600. If new equipment were required, it is estimated the total first cost would run close to $6,000.

Assuming that the original charge will properly purify for a period of one year, the annual operating costs approximate $1,170, divided as follows:

Interest at 7%	$ 252.00
Depreciation, 10 yr. 6% sinking fund	273.00
Taxes	72.00
One charge of Oxide, 1,465 cu. ft.	513.00
Labor, 6 man-days	60.00
	$1,170.00

TABLE NO. 5.

Origin of Sample	Grains H_2S per 100 cu. ft. of gas. (Cadium Acetate method)	Railroad Commission Qualitative Test (Lead acetate strip method) Official one minute exposure	Extended three minute test
Untreated lean gas to old Oxide bed (A)	5.0	.....	.....
Partly treated lean gas after leaving the old bed and before entering the new bed (B)	0.3	Positive	Very positive
Treated lean gas after leaving new bed (B)	.....	Negative	Negative

This corresponds to a cost of 1.07 mills per M c.f. of gas purified, assuming a daily treatment of 3,000,000 feet of gas.

In the drawing of gas contracts in the future, it would doubtless be well to definitely specify the allowable quantities of the three common sources of internal corrosion, hydrogen sulphide, oxygen, and free water, that are to be permitted in the delivered gas.

VIII. Acknowledgements

Before closing it would be well to make certain acknowledgements. The writer is particularly indebted to C. D. Gard of the Union Oil Co. who constructed the purification plant; P. H. Jones of the same company, who conducted a large part of the analyses detailed in the first section of this report; and to Earl Lowell of the Del Rey Oil and Gas Co. for his willing cooperation in the experimental work.

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Chicago Heating Customers May Eliminate Peak Bills

RESIDENTIAL and space heating customers of The Peoples Gas Light and Coke Co. may now elect to pay their heating bills in equal monthly installments under a ruling just announced by the company and approved by the Illinois Commerce Commission. This plan enables the customer to eliminate the peak bills of mid-winter by building up a substantial credit in his favor through payment of a regular amount each month, determined by estimating the customer's total bills up to May 31st and dividing this total by the number of whole calendar months between the date he elects to be billed under this plan (if this date is on or before October 31) and April 30.

If the customer's total bill at any time exceeds the budget payment, plus the credit he has built up, the customer will be billed for the full amount of the difference. The average bill of a customer commencing the plan between October 31 and December 31 will be determined by estimating the total bills between the date he elects to take the plan and May 31, and dividing this total by the number of whole calendar months intervening between the date of his election and March 31. A customer who begins to use gas for house heating after December 31 will not be eligible for this budget plan until the following May 1.

Kentucky Utility Increases 1934 Natural Gas Sales

Kentucky Natural Gas Co., Owensboro, Ky., reports an increase of 20-25 per cent in gas sales for the first eight months of 1934, according to W. J. Hinchey, general manager of the company.

WEDGEWOOD

Modern Heavy Duty Restaurant Gas Ranges

Now, Wedgewood incorporates a score of modern features new to heavy duty gas range design and construction. Three of these economical, convenient ranges are illustrated here. The complete line includes a type and style for every cooking need. A new bulletin illustrates and describes Wedgewood Heavy Duty Gas Ranges as well as Heavy Duty plates, griddles, etc. Send for your copy.

Modern Wedgewood Features:

Heavily insulated full porcelain ovens. Greater fuel saving. Fully enclosed valve manifolds enhance outward appearance. Easily cleaned. Bright, clean, chromium trimmed porcelain exteriors. Exact oven heat regulation to take the guess-work out of baking. Porcelain enameled ovens. Evercool door pulls and valve handles. Concealed flue. Push button burner lighters. Quickly accessible valve adjustments and a score more of the finest features ever seen on any heavy-duty gas range.

MODEL 521

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RESTAURANTS
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NO-OX-ID
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The Original Rust Preventive

Many Companies Now Reordering

NO-OX-ID has been reordered by many companies this season for coating and sealing. Many are applying it this fall. In the North, October is the last month of satisfactory weather for application of coatings to holders. Material cost is less than any other reliable coating that contains a rust inhibitor. Labor cost is least. Recommendations and estimates submitted promptly.

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PROTECTION SUPREME FOR STEEL

Texas Committee Recommends on Gas Wastage

ON SEPTEMBER 9 a committee of the Texas legislature, created several months ago to investigate wastage of gas and oil in the state and recommend appropriate legislation, brought in a preliminary report to the Legislature.

Reporting on the Panhandle field, the world's largest known gas field, the committee stated that it contained a total of 2820 wells, including 935 gas wells, the majority of the oil wells also producing large quantities of natural gas. Daily open flow capacity of all gas wells was given at 17,600 million cubic feet. Gasoline extraction plants in the field number 40 with 1,810 million cubic feet daily gas capacity, gas content varying from .264 to .34 gallon per M c.f.

Nineteen gas pipe lines transport Panhandle gas to Colorado, Nebraska, Iowa, Illinois, Missouri and other points. Pipe line companies were stated to own 80 per cent of the gas-bearing acreage in the field.

With wastage proceeding in the field at the rate of a billion cubic feet daily it was stated that the field would become exhausted in five years, whereas adequate protection measures conserving the gas for future fuel and lighting purposes, might extend the life of the field for this use as long as 75 years.

The committee recommended that appropriate legislation be passed to prevent waste in the production of gas; specifying among other items:

(1) That pipe line companies, casinghead plants and carbon black plants should be required to take ratably a sufficient amount of gas to meet the legitimate demands. . . . and that all parties in this field be restricted to a ratable production of gas irrespective of waste. . . .

(2) That a tax of one-half cent per M c.f. be placed on the production of natural gas in Texas.

(3) That all taxes paid to the State for the production of natural gas be refunded on such gas as is repressured into the same horizon from whence it came.

(4). We recommend the passage of legislation to equitably allocate the market for gas used for light and fuel among the several owners of a common pool, and when a ratable market on a fair basis and at a reasonable price is provided, the use of gas then be restricted to light and fuel usage, as Article 6008, Revised Statutes, originally provided.

(5). In areas productive of gas containing a high content of hydrogen sulphide or other substances rendering it unfit for light and fuel usage, and where the cost of treating such gas for the removal of its objectional contents is prohibitive, it is recommended special permits be granted to allow the use of such gas for the manufacture of gasoline and the residue be utilized in the manufacture of carbon black or other similar uses, and under no circumstances that the residue gas be blown into the air.

(6). That the issuance of further carbon black permits, and the renewal of existing permits to be contingent upon the requirement that carbon black plants take their gas requirements ratably from all such gas as is available for this usage.

(7). That legislation be passed restricting the amount of gas produced with oil, and we think that the ratio of gas produced with oil should be materially decreased. . . .

(8). We recommend that there be levied and collected a tax of 2c per thousand cubic feet upon all gas produced and sold at the well at a price less than 4c per thousand cubic feet.

(9). We recommend legislation requiring all natural gas produced in Texas to be stripped of its gasoline content before moving more than 20 miles from point of origin in pipe lines.

(10). It is further recommended that any taxes above referred to be levied as an occupation tax on the occupation of producing natural gas and not as a tax on the property itself.

Meet "Harry Hott" and "Reddy Watt" of B. C. Electric

BRITISH Columbia Electric Railway Co.'s publicity department, of which J. Lightbody is manager, has placed a new pair of employees upon the company's payroll recently, known as the "service twins." The twins go by the names of Harry Hott and Reddy Watt, and made their first appearance in the company's publication, "Home Service News," for September. Harry Hott, the reader will gather, typifies gas service, and Reddy Watt electric.

It is intended, according to Mr. Lightbody, to use the service twins wherever they can call consumers' attention to the convenience of gas and electric service. They will appear frequently in "Home Service News," and prizes will be offered regularly for verses written about them by consumer readers. A standing offer of $1 for any verse of six lines is being made, which will help to add readers for "Home Service News."

For the time being the "Home Service News" contest will be the principal function for the twins, but it is thought that eventually, when they are better known, they may serve the merchandising department also by use in advertising.

Free Gas Is Feature of Seattle Heating Appeal

In a Fall Househeating campaign now under way the Seattle (Wash.) Gas Co. is offering a special inducement of 50 M c.f. of free gas (equivalent to about $30 at an average price of 60 cents per M) for the prospect's old furnace. Down payment of $30 and 24 equal monthly payments for the balance are included in the plan. The free gas will be deducted from peak month bills, 20 M c.f. in December, 20 M c.f. in January, and 10 M c.f. in February.

Kentucky Natural Gas Corp. Expansion Program Under Way

The Kentucky Natural Gas Corp., with general offices at Owensboro, Ky., has under construction at this time two compressor stations, according to W. T. Stevenson. Each station contains two 180 h.p. compressor units.

The compressor stations are being constructed to take care of the additional load developed along the company's 630-mile pipe line system that extends from the gas fields in Medcalf, Barren, Green and Hart Counties, Ky., to Terre Haute, Ind., with numerous sales laterals to markets and other gas fields near the main trunk line. This pipe line system serves directly and indirectly through connecting pipe lines, 50 cities and communities in western Kentucky and southwestern Indiana, having an aggregate population of approximately 290,000 people.

A natural gas distribution system that will serve a suburban district in the outskirts of Evansville, Ind., is also being laid by the company.

Lindsborg, Kansas, to Have Municipal Gas Plant

A $55,000 bond issue was voted for construction of a gas distribution system in Lindsborg, Kans., at a special city election held September 13, according to J. O. Stromquist, city clerk. The city has a population of 2100. Natural gas supply will come from fields approximately 12 miles distant. The Kansas Power & Light Co. is now serving Lindsborg out of its Salina division.

Wichita Falls Utility Begins Laying System

The Wichita Falls (Texas) Gas Co., formed recently to serve natural gas in Wichita Falls, is now ready to begin laying its distribution system. The company has signed up 7,800 consumers, service to begin the latter part of October. Formal application for a franchise was made to the city September 10. T. H. Hutcherson is general manager of the new utility.

Detroit Vapor Stove Co. Sold to Borg-Warner Corp.

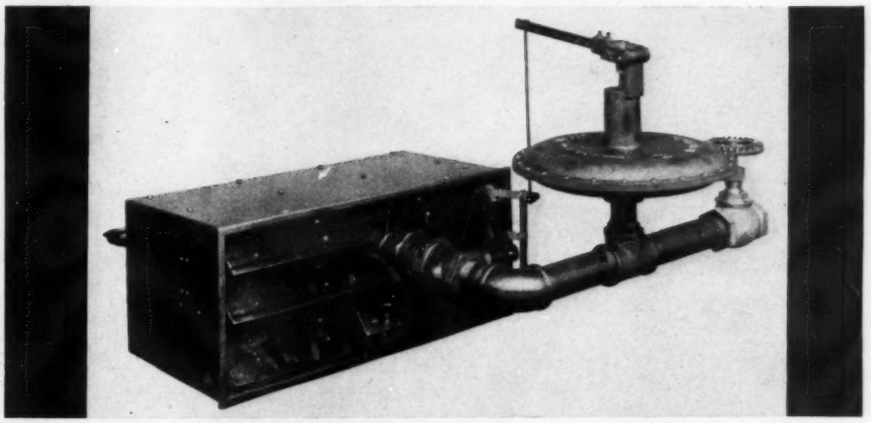
The Detroit Vapor Stove Co., Detroit, Mich., was purchased August 30 by the Borg-Warner Corp., to complete the latter's line of home appliances. The Detroit Vapor Stove Co. entered the gas range market in 1925 after 30 years in the manufacture of oil stoves. The company ranked among the five largest manufacturers of gas ranges in 1933.

Dallas Gas Co. Razes Holder

The Dallas Gas Co. has completed razing a 518,000 cu. ft. waterseal gas holder, built in 1906 at a cost of $48,000, for the storage of manufactured gas. The holder weighed 420 tons and was of 94-foot diameter.

Okla. City Postpones Gas Election

The city council of Oklahoma City, Okla., has postponed the gas bond election announced for October 2 to January 16, 1935.



POSITIVE, AUTOMATIC CONTROL OF BOTH AIR AND GAS WITH N. G. E. SERIES 100

The N.G.E. Series 100 Gas Burner combines the best features of the multiple jet and Venturi types. It meets, to an unusual degree, all requirements for correct heat application and high combustion efficiency. Automatic and accurate control of *both* air and gas is provided in this new unit, bringing high combustion efficiency formerly available only in large central plant installations.

Series 100 eliminates costly boiler maintenance as it prevents the rush of cold air through the boiler flues during periods of light load. Louvres may be operated automatically by the automatic combustion control, as illustrated, or manually, if so desired, for regulation of both primary and secondary air.

Series 100 Burners will operate efficiently with gas of any commercial b.t.u. content, chemical composition or specific gravity and at any pressure from a few inches of water to 8 lbs. These burners are characterized by their compact design and neat appearance. Write for bulletin showing the various types and sizes of N.G.E. Automatic Control Gas Burners.

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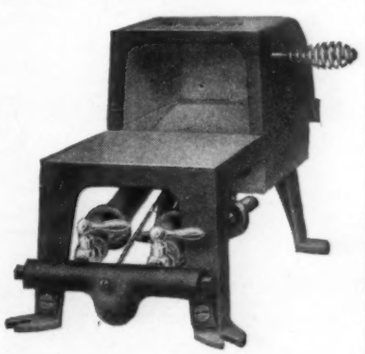
LOOK TO THE PIONEERS FOR CONTINUED LEADERSHIP

JOHNSON NO. 502 BENCH FURNACE

Here's a handy, efficient, inexpensive furnace that heats soldering coppers quickly and without forced air blast. Has two burners, each with pilot light and shut-off valve. Write for details.



JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

Pacific Coast Representative—C. B. Babcock Co. 135 Bluxome St., San Francisco, Calif.

Gas Company Office Brightest Spot in Neighborhood

TWO new Humphrey 3000 candle power gas lamps installed on the exterior of the Larrabee Street branch office of The Peoples Gas Light and Coke Co. make this building the brightest spot in the neighborhood. Set at a height of 16 feet the lamps flood the facade of the building, the sidewalk and to a considerable extent the street, in a bath of brilliant, friendly light. Adjacent buildings, ordinarily well illuminated, seem obscure in comparison to the Gas Building.

Located at a street car halt, at a busy intersection, the effect is striking and from some distance the eye is drawn to the cheerful spot.

Installation of these lamps is comparatively simple and the operation causes no concern since the turning on and off is effected by a remote control valve on a time clock switch. Two double mantles distribute the light without an irritating focal point, giving a lunar source of light rather than a piercing brightness.

The lamps are designed to operate on low pressure gas and burn from 35,000 to 37,000 B.t.u. per hour. These are the first gas floodlights to be seen on a Chicago business building in recent years and they mark the reentry of gas in this field. Two gas lamps of the same intensity and general structure but of special exterior design were installed on gas industry hall at A Century of Progress where they are the only direct lights used, all other lights being indirect or shaded.

Atmospheric Pressure Can Be Maintained at All Times

Fulton Duplex Vacuum Regulator

ON a system discharging gas to a line under light pressure, the Fulton Duplex Vacuum Regulator will definitely prevent the pulling of a vacuum and will maintain atmospheric pressure at all times. When pressure in the storage tank falls, the valve closes. This is a valuable safeguard. Full description and prices will be mailed on request.

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OR ANY JOBBER

Kans. City Gas Co. Sells 117 Ranges in Two Apartment Hotels

The Kansas City Gas Co. late in August made important range sales to two apartment hotels in Kansas City. The company sold 49 new ranges for use in the Ricardo Hotel, replacing electric ranges; and 68 new gas ranges for use in the Alexandria Apartment Hotel, replacing old gas ranges.

The ranges for the Ricardo Hotel were purchased through H. S. Shapiro, manager of the Assured Rental Co., from H. D. McGrath, industrial engineer of the gas company new business department. The ranges for the Alexandria were purchased by the Shryock Realty Co. through Frank Pexton, industrial engineer of the Kansas City Gas Co. The managers and owners of the Ricardo Hotel are changing from electric to gas ranges in order to make a substantial saving in the operation of the apartment building, while new ranges are being placed in the Alexandria in order to give the tenants of this hotel improved cooking results.

Bowdoin Utilities Tests Fort Peck System

Natural gas service was scheduled to start at the Fort Peck, Mont., townsite the latter part of September, according to James Phillips, manager of the Bowdoin Utilities Co. Gas was turned into the newly constructed distribution system for test purposes the early part of September.

Oklahoma Natural Renews Franchises

Oklahoma Natural Gas Co. during the past three months has renewed franchises in eight Oklahoma towns, according to M. L. Kapp, supervisor of district managers for the utility. They are: Broken Arrow, Coweta, Porter, Depew, Davenport, Wellston, Meeker and Checotah. The franchise grants provide for a 2 per cent tax on domestic gas sales.

First Important Utah Find

Ramsey Petroleum Corp. early in September brought in a 30,000,000 cubic foot daily capacity gas well on the Last Chance structure in Emery County, Utah, proving up the first important natural gas area in the state.

Macomb Gas Plant Being Wrecked

The old gas plant at Macomb, Ill., which has been taken over by the Central Illinois Public Service Co., Springfield, is being demolished, including wrecking of the generation plant, building, and storage tanks.

District Office Enlarged

The People's Natural Gas Co., Forest City, Ia., district office is being moved to larger quarters in the Oddfellows Building, to provide additional office and display room facilities.

HERE'S GREATER DOLLAR VALUE *for* GAS COMPANIES

CHECK THE ADVANTAGES THAT EVENTUALLY MEAN MORE PROFITS!

- ✓ *Reliability.*
- ✓ *Great tensile strength.*
- ✓ *A high degree of ductility.*
- ✓ *Adaptability for any type of joint.*
- ✓ *Less interruption to service.*
- ✓ *Lower laying costs.*
- ✓ *Longer lengths.*
- ✓ *Tight joints and less joints per mile.*
- ✓ *Various coatings available for bad soil conditions.*

DOLLAR for dollar—steel mains will yield better profits for Gas Companies. This is being proved over and over every year as steel pipe continually demonstrates its fitness for the necessary requirements of safety, efficiency, and economy.

Users have found that modern steel pipe is capable of withstanding severe external strains as well as those from within. Vibration (heavy street traffic), cave-ins, trench pressures, shocks, wash-outs, settling of filled ground and other external factors that place a heavy burden on underground lines are successfully met by the ductility and high tensile strength of steel pipe.

NATIONAL Steel Pipe for gas mains is made to rigid specifications by the largest manufacturer of steel tubular products in the world. You obtain with it the benefit of proved manufacturing methods and experience in pipe problems. Check its advantages and you find they mean greater dollar value. Specify NATIONAL for superior performance. NATIONAL engineers will gladly answer any further questions you may have concerning steel gas mains.

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
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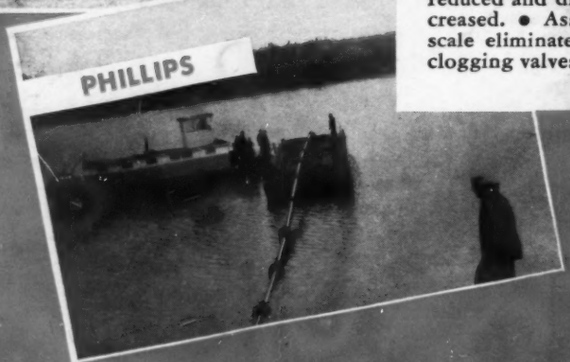
NATIONAL STEEL GAS MAINS

REPUBLIC

ELECTRIC WELD

PIPE

Republic Electric Resistance Welded Pipe (patented) has made economically possible today's development of oil, gas and gasoline pipe line construction. • Uniform wall thickness (no thin spots—no thick spots) and true roundness make it easy to match up the ends perfectly, resulting in increased speed in field joint welding. • This same uniform wall thickness around the entire circumference permits the use of lighter weights per foot than can be used with pipe made by other processes—in short, full utility is obtained from the pipe purchased. • Then, too, this process provides for longer lengths—up to fifty feet with no mid-weld—again reducing installation costs. • Cold forming from flat-rolled steel makes certain an inside surface so smooth that friction is reduced and discharge capacity increased. • Assured freedom from scale eliminates the possibility of clogging valves and meters.



REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO